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A Compendium of Field Reports for the North Slope (Wahluke Slope) Expedited Response Action, Hanford, Washington

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Office of Environmental Restoration and
Waste Management

United States
Department of Energy
P.O. Box 550
Richland, Washington

Approved for Public Release

TRADEMARK DISCLAIMER

INTRODUCTION

This compendium contains field activity reports generated during the Expedited Response Action cleanup of the North Slope (Wahluke Slope) of the Department of Energy's Hanford site. It is intended to provide the reader with a detailed accounting of the activities performed. Complete laboratory analytical data for environmental samples is not provided because of the tremendous volume of data. Instead, analytical data has been summarized and presented.

CONTENTS

1.0 DRAFT FINAL REPORT-LANDFILL CHARACTERIZATION AND REMEDIATION HANFORD NORTH SLOPE, WASHINGTON

2.0 EXPEDITED RESPONSE ACTION PHASE I FIELD ACTIVITIES REPORT HANFORD-NORTH SLOPE

3.0 EXPEDITED RESPONSE ACTION PHASE II FIELD ACTIVITIES REPORT HANFORD-NORTH SLOPE

4.0 NORTH SLOPE WELL DECOMMISSIONING REPORT

5.0 GEOPHYSICS SURVEY 2,4-D SITE HANFORD, NORTH SLOPE

6.0 2,4-D SITE REPORT

SECTION 1

MISCELLANEOUS ARCHITECT ENGINEER SERVICES FOR HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE (HTRW) PROJECTS FOR U.S. ARMY CORPS OF ENGINEERS WALLA WALLA DISTRICT

DRAFT FINAL REPORT

LANDFILL CHARACTERIZATION AND REMEDIATION
HANFORD NORTH SLOPE, WASHINGTON

CONTRACT NO. DACW68-94-D-0001

October 21, 1994

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
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MISCELLANEOUS ARCHITECT ENGINEER SERVICES
FOR HAZARDOUS, TOXIC, AND
RADIOLOGICAL WASTE (HTRW) PROJECTS
FOR
U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA DISTRICT

DRAFT FINAL REPORT
LANDFILL CHARACTERIZATION AND REMEDIATION
HANFORD NORTH SLOPE, WASHINGTON

CONTRACT NO. DACW68-94-D-0001

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TABLE OF CONTENTS

SECTION			PAGE
DISTRIBUTION			ii
LIST OF FIGURES			vi
LIST OF TABLES			vii
EXECUTIVE SUMMARY			ix
1.0	INTRODUCTION		1-1
	1.1	Objectives	1-1
	1.2	Scope	1-1
	1.3	Report Organization	1-3
2.0	BACKGROUND		2-1
	2.1	Site Location	2-1
	2.2	Site History	2-1
	2.3	Previous Investigations	2-16
3.0	FIELD ACTIVITIES		3-1
	3.1	Geophysical Surveys	3-1
		3.1.1 Geophysical Equipment	3-1
		3.1.2 Survey Procedures	3-2
	3.2	Trenching/Waste Excavation Activities	3-3
	3.3	Subsurface Soil Sampling	3-4
4.0	RESULTS		4-1
	4.1	Geophysical Survey Results	4-1
		4.1.1 H-06-L Site	4-1
		4.1.2 H-12-C Site	4-1
		4.1.3 H-12-L Site	4-1
		4.1.4 H-81-R Site	4-10
		4.1.5 H-83-C Site	4-10
		4.1.6 H-83-L Site	4-10
		4.1.7 PSN 01 Site	4-10
		4.1.8 PSN 04 Site	4-21
		4.1.9 PSN 12/14 Site	4-21
		4.1.10 PSN 72/82 Site	4-21
		4.1.11 PSN 90 Site	4-21
		4.1.12 Bridge Overlook Sites	4-31
		4.1.13 Igloo Sites	4-31

TABLE OF CONTENTS (continued)

SECTION PAGE

4.2 Trenching/Excavation Results 4-31
4.3 Sampling and Analytical Results 4-49
4.3.1 Site H-06-L West/Anomaly A-4W 4-49
4.3.2 Site H-06-L East/Anomaly A-1E 4-59
4.3.3 Site H-06-L/Miscellaneous Waste Sampling 4-61
4.3.4 Site H-83-L/Anomaly A-3 4-62
4.3.5 Site H-83-L/Anomaly A-6 4-62
4.3.6 Site PSN 04/Anomalies A-1/A-6 4-63
4.3.7 Site PSN 12/14/Anomalies A-1/A-3 4-63
4.3.8 Site PSN 90/Former Vehicle Rack 4-63
4.4 Analysis of Background Data 4-64

5.0 QUALITY ASSURANCE/QUALITY CONTROL 5-1
5.1 Laboratory 5-1
5.2.2 Precision 5-3
5.2.3 Accuracy 5-4
5.2.4 QC Frequency 5-5
5.2.5 Completeness 5-5
5.2.6 Comparability 5-5
5.2.7 Representativeness 5-5
5.3 Laboratory Quality Control 5-6
5.3.1 Analytical Methods 5-6
5.3.2 Holding Times 5-7
5.3.3 Laboratory Quality Control Samples and Data Qualification 5-7
5.4 Field Quality Control 5-9
5.4.1 Field Duplicate Samples 5-9
5.4.2 Trip Blanks and Rinsates 5-11
5.4.3 Deviations from Field Procedures 5-11
5.5 Data Usability Summary 5-11

6.0 CONCLUSIONS 6-1
6.1 Summary of Findings 6-1
6.2 Disposition of Hazardous and Contaminated Materials 6-2

7.0 REFERENCES 7-1

APPENDIX A GEOPHYSICAL SURVEY REPORTS

APPENDIX B PHOTOGRAPHS OF FIELD ACTIVITIES

TABLE OF CONTENTS (continued)

APPENDIX C ANALYTICAL DATA SUMMARY – BACKGROUND SAMPLES

APPENDIX D ANALYTICAL DATA SUMMARY – SITE AND WASTE CHARACTERIZATION SAMPLES

APPENDIX E NORTH SLOPE WASTE INVENTORY

LIST OF FIGURES

FIGURE		PAGE
1-1	Site Location Map, Hanford North Slope, Washington	1-2
2-1	Location of Landfill Site, H-06-L (East and West)	2-3
2-2	Location of Site H-12-C	2-4
2-3	Location of Site H-12-L	2-5
2-4	Location of Site H-81-R	2-6
2-5	Location of Site H-83-C	2-7
2-6	Location of Landfill, Site H-83-L	2-8
2-7	Location of PSN 01	2-9
2-8	Location of PSN 04	2-10
2-9	Location of Site PSN 12/14	2-11
2-10	Location of PSN 72/82	2-12
2-11	Location of Site PSN 90	2-13
2-12	Location of Bridge Overlook Sites	2-14
2-13	Location of Igloo Sites	2-15
4-1	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-06-L (East and West)	4-3
4-2	Hanford North Slope, Site Map with Geophysical Interpretation, Landfill Site H-06-L West (WHC 1992 and HLA 1994)	4-5
4-3	Hanford North Slope, Site Map With Geophysical Interpretation, Landfill Site H-06-L East (WHC 1992 and HLA 1994)	4-7
4-4	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-12-C	4-9
4-5	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-12-L 1	4-11
4-6	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-12-L 2	4-12
4-7	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-81-R	4-13
4-8	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-83-C	4-15
4-9	Hanford North Slope, HLA Geophysical Survey Coverage, Site H-83-L	4-17
4-10	Hanford North Slope, Site Map With Geophysical Interpretation, Landfill Site H-83-L (WHC 1992 and HLA 1994)	4-19
4-11	Hanford North Slope, HLA Geophysical Survey Coverage, Site PSN 01	4-20
4-12	Hanford North Slope, USACE Geophysical Survey Coverage, Site PSN 04	4-23
4-13	Hanford North Slope, HLA Geophysical Survey Coverage, Site PSN 12/14	4-25
4-14	Hanford North Slope, HLA Geophysical Survey Coverage, Site PSN 72/82	4-27
4-15	Hanford North Slope, HLA Geophysical Survey Coverage, Site PSN 90	4-29
4-16	Hanford North Slope, HLA Geophysical Survey Coverage, Bridge Overlook 1	4-33
4-17	Hanford North Slope, HLA Geophysical Survey Coverage, Bridge Overlook 2	4-35
4-18	Hanford North Slope, HLA Geophysical Survey Coverage, Site Igloo 1	4-37
4-19	Hanford North Slope, HLA Geophysical Survey Coverage, Site Igloo 2	4-39

LIST OF TABLES

TABLE		PAGE
2-1	Hanford North Slope Site Location Information	2-2
4-1	Summary of Trenching Activities, Hanford North Slope, Landfill Characterization	4-41
4-2	Total Number of Soil/Debris Analyses, Hanford North Slope, Landfill Characterization	4-50
4-3	Total Number of Aqueous Samples, Hanford North Slope, Landfill Characterization	4-51
4-4	Sample Summary, Hanford North Slope, Landfill Characterization	4-52
5-1	Summary of Samples Submitted for Analysis	5-2
5-2	RPDs for Field Duplicates by Site	5-10
5-3	Deviations from Field Procedures	5-12

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EXECUTIVE SUMMARY

Under the direction of the US Army Corps of Engineers Walla Walla District, CDM Federal Programs Corporation completed an investigation and cleanup of thirteen former military sites on the Hanford North Slope, Washington. This project employed the observational approach (i.e., concurrent characterization and remediation) to accomplish the goals defined in Tri-Party Agreement Milestone M-16-82 within an expedited schedule. The objectives of the investigation and cleanup were to determine if any hazardous or contaminated materials were present in suspected landfill areas associated with the thirteen former military sites and to characterize and segregate these materials for later determination of proper treatment and/or disposal.

Site characterization and remediation consisted of geophysical investigations, excavation and field screening of buried waste materials, sampling and analysis of suspect wastes, and segregation of confirmed hazardous or contaminated materials. Geophysical investigations employed electromagnetic profiling and magnetics techniques to locate buried metallic and non-metallic waste materials. Areas exhibiting anomalous geophysical response were marked in the field for subsequent excavation. A D7 bulldozer and trackhoe with 1 or 2 cubic yard bucket were used to uncover and excavate landfill cells and other buried wastes. Wastes were field screened using several criteria including visual observation, direct-reading instruments, and analyte-specific field analytical test kits. Suspect wastes were sampled for characterization by an offsite laboratory under a quick turn-around schedule. Materials confirmed as hazardous or contaminated by non-regulated substances (i.e., petroleum hydrocarbons) were segregated pending determination of proper disposition. Excavations were backfilled and compacted using non-hazardous materials and clean fill and graded to original conditions.

The project was completed according to approved work plans and strict quality assurance and quality control (QA/QC) requirements. Field procedures followed standard operating procedures and were thoroughly documented. Samples were collected, shipped, and analyzed under chain-of-custody requirements and according to approved EPA analytical methods. A portion of all samples were provided to the US Army Corps of Engineers Quality Assurance Laboratory for independent analytical verification. At the conclusion of the field effort, quality control data were compared to pre-established data quality objectives. This evaluation verified the usability of the data for the intended purpose.

During the course of the site characterization, approximately 17,900 cubic yards of suspected waste materials were excavated and evaluated. Field screening and laboratory analytical data were used to classify approximately 1,050 cubic yards of this material (less than 6% of the total material excavated) as hazardous or contaminated. Wastes segregated for offsite treatment and/or disposal included 600 cubic yards of DDT-contaminated soil and debris, 450 cubic yards of soil and debris contaminated with petroleum hydrocarbons, and less than 1 cubic yard each of lead-based paint-contaminated materials and asphalt-tar based materials.

All hazardous and contaminated materials encountered during the investigation and cleanup of the North Slope sites were transported and disposed of offsite by September 30, 1994.

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1.0 INTRODUCTION

This report was prepared for the Department of Energy (DOE) under direction of the U.S. Army Corps of Engineers Walla Walla District (USACE) by CDM Federal Programs Corporation (CDM Federal) under Contract No. DACW68-94-D-0001. This report describes the investigation and cleanup of 13 suspected former military landfill sites on the Hanford North Slope, Washington (Figure 1-1). These activities occurred between April 19, 1994 and August 10, 1994.

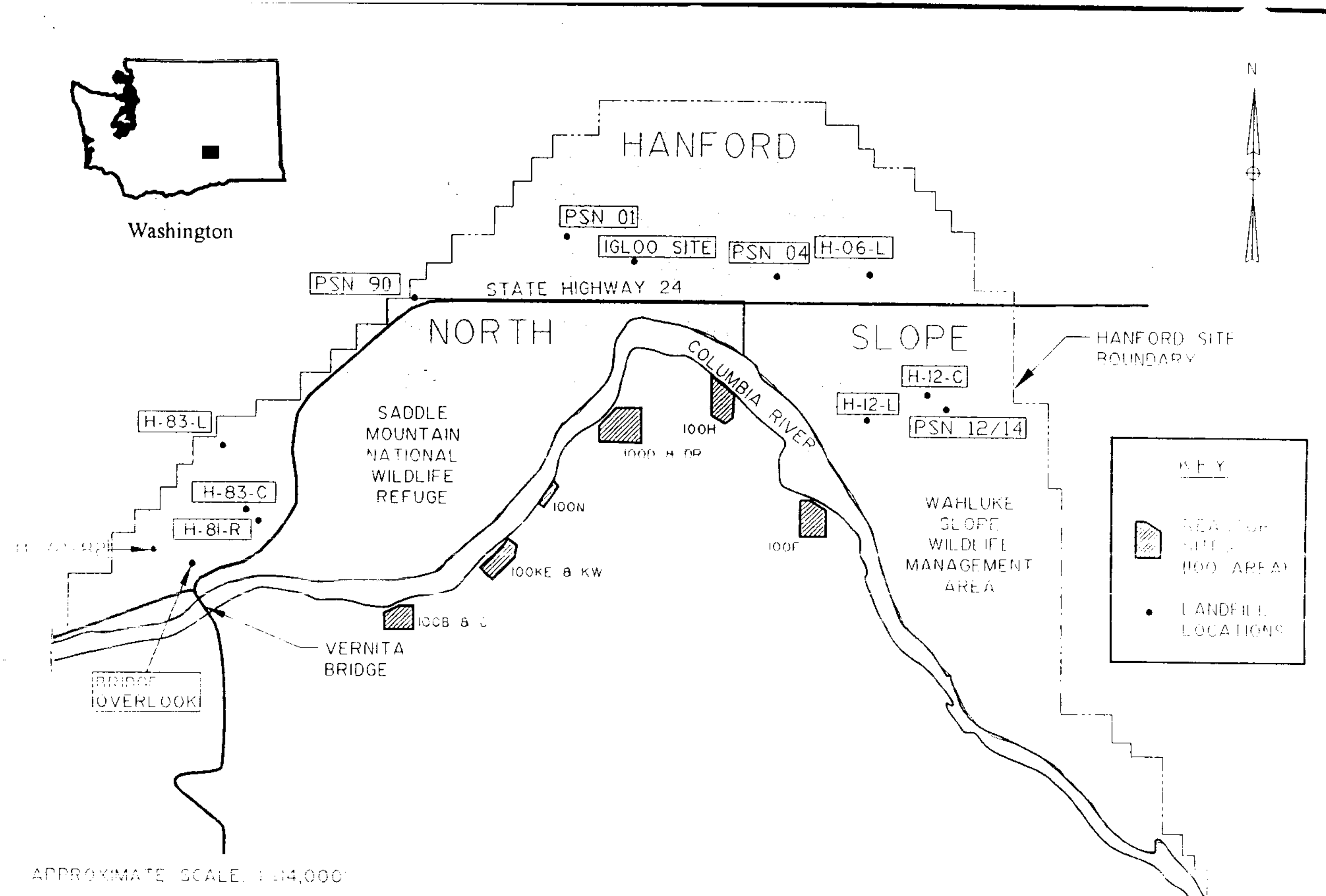
Investigation and cleanup of these sites are required under the Hanford Site Tri-Party Agreement, (TPA), Milestone No. M-16-82. A variety of remedial alternatives were proposed for the North Slope in the Expedited Response Action (ERA) Proposal developed by the DOE (1993). This ERA Proposal describes the North Slope sites and identified a preferred alternative which utilizes the "observational approach" (i.e., concurrent characterization and remediation). The Washington State Department of Ecology, Lead Regulatory Agency for the North Slope ERA, concurred with the preferred alternative and provided formal approval in the Hanford North Slope Action Memorandum (1994). The technical approach employed for this investigation and cleanup is based on the ERA and Action Memorandum and is described in the Landfill Characterization and Remediation, Site H-06-L, Work Plan and Quality Assurance Project Plan (CDM Federal 1994a) and subsequent addenda (CDM Federal 1994b-g).

1.1 OBJECTIVES

The objectives of the investigation and cleanup were to determine if any hazardous materials are present in disposal cells at the thirteen suspected landfill sites and to characterize and segregate these materials for proper treatment and/or disposal. These activities were undertaken to reduce future risks to human health and the environment and provide data for use in the evaluation of future land use options. These objectives were accomplished through the excavation of buried wastes, segregation of potentially hazardous material using methods of visual observation, field screening techniques (direct-reading instruments and analyte-specific field test kits), and laboratory analyses of soil and debris samples. These activities were conducted in an expeditious manner so as to satisfy the schedule requirements of TPA Milestone No. M-16-82.

1.2 SCOPE

The scope of the investigation and cleanup included areas of the Hanford North Slope previously identified as potential waste burial features based on earlier field reconnaissance and geophysical surveys (WHC 1990, 1992). The project scope, as defined in the above referenced site work plans, consisted of the confirmation of buried waste locations using surface geophysical methods followed by the partial or complete excavation of waste materials. Hazardous or contaminated materials were isolated and characterized prior to backfilling and grading of the excavations. Transportation and disposal of hazardous and



SITE LOCATION MAP
HANFORD NORTH SLOPE, WASHINGTON

CDM FEDERAL PROGRAMS CORPORATION
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Figure No. 1-1

contaminated materials were completed under separate contract, as described later in this report.

1.3 REPORT ORGANIZATION

This report describes methods used and presents findings and results of the Hanford North Slope landfill investigations and cleanup. Section 2.0 provides a brief summary of the location, history, and previous investigations of the North Slope sites. Technical approach and methods employed in the investigation and cleanup of these sites are presented in Section 3.0. A discussion of the results of investigation activities comprises Section 4.0 of the report. Section 5.0 summarizes Quality Assurance/Quality Control (QA/QC) measures taken and results. Conclusions, including information regarding the disposition of contaminated materials, are provided in Section 6.0. Detailed geophysical survey reports, photographs of field activities, analytical data summaries, and a final waste inventory are presented in the report appendices.

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2.0 BACKGROUND

The following sections present a brief outline of site location, history, and previous investigations of the Hanford North Slope Sites. More detailed information is available in the work plan (CDM Federal 1994a), ERA Proposal (DOE 1993), and in the North Slope Investigation Report (WHC 1990).

2.1 SITE LOCATION

All thirteen of the sites investigated are located within Grant County in the southeast portion of Washington. The sites occur within an area known as the Hanford North (or Wahluke) Slope. This area of 140 square miles forms the portion of the Hanford Reservation north of the Columbia River (Figure 1-1). The main portion of the Hanford Reservation lies south and west of the Columbia River. Access to the thirteen sites is by Highway 24 which bisects the North Slope from west to east.

The predominant grade in the North Slope area is from Saddle Mountains (elevation 2696 ft) in the north to the Columbia River (elevation 390 ft) to the south. The climate is arid and vegetation is typified by sagebrush and open grasslands. Annual precipitation averages less than 8 inches.

Table 2-1 provides pertinent location and site description information for each of the thirteen sites investigated. Figures 2-1 through 2-13 illustrate site locations.

2.2 SITE HISTORY

The North Slope was homesteaded from the late 1800s until the government took control of this area in the early 1940s. Prior to government control of the North Slope, homesteaders used the land primarily for grazing sheep and cattle, and for growing row crops and orchards. Wheat was the principal crop grown on high ground away from the river. Grazing took place on land too arid or too distant from water for crops.

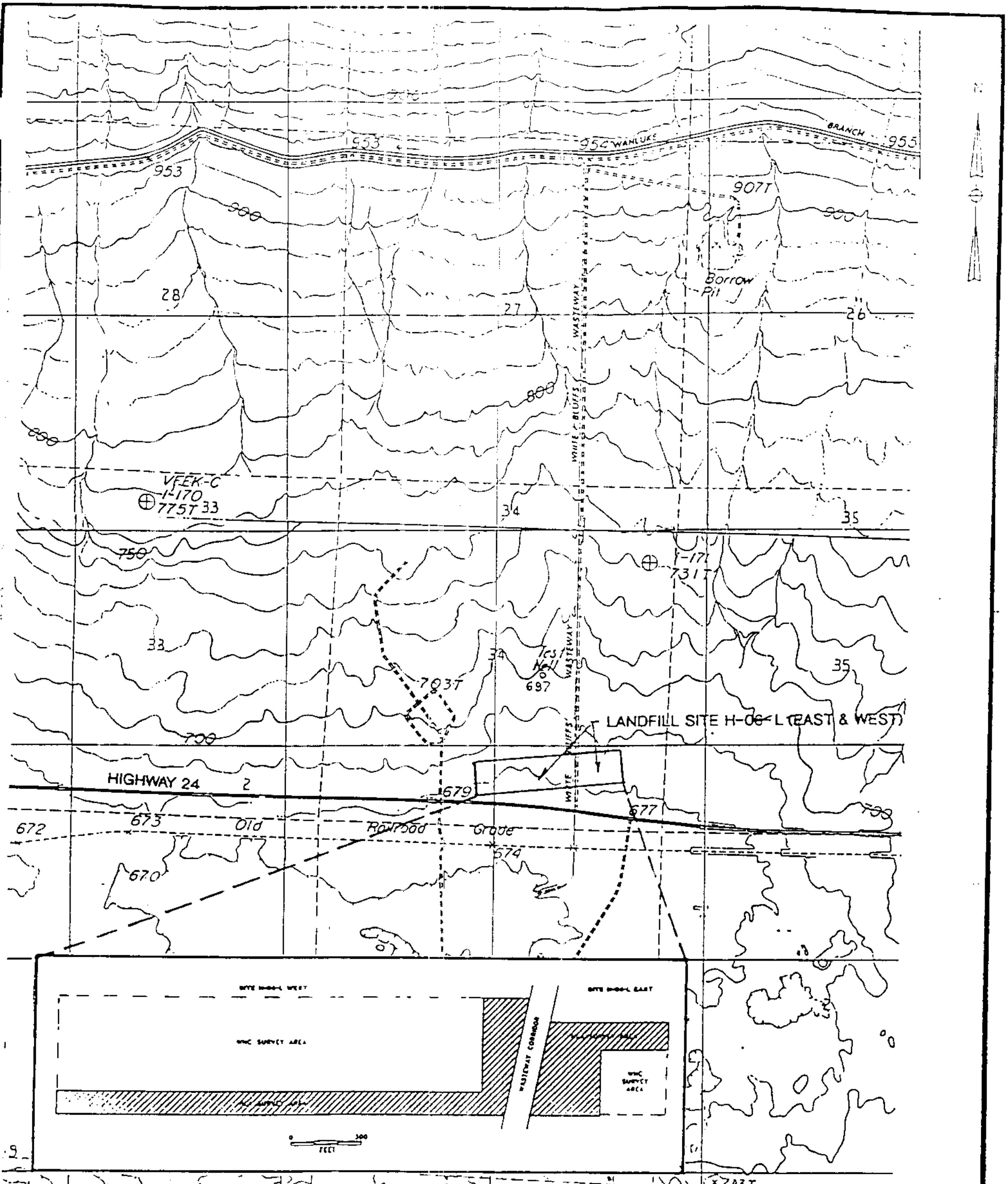
Additional land acquisitions took place in the 1950s for construction of the Nike Missile Air Defense System and anti-aircraft emplacements, and for enlargement of the buffer zone to isolate the restricted lands and the production areas of the reservation from the public. A total of seven anti-aircraft gun emplacements and three Nike missile positions were located on the North Slope. These military sites were closed down in the early 1960s. Many of the military buildings were considered a potential hazard to the public and were torn down or decommissioned in the mid-1970s. Evidence remains of the existence of many of these buildings. The area has not had any active military installations since this period; however, the area has been used for military training maneuvers.

TABLE 2-1

HANFORD NORTH SLOPE SITE LOCATION INFORMATION

Site	Location	Elevation[1]	Approximate Size
H-06-L	T15N, R27E, Section 34	680 ft	20 acres
H-12-C	T14N, R27E, Section 24	855 ft	0.3 acres
H-12-L	T14N, R27E, Section 23	690 ft	1.25 acres
H-81-R	T14N, R25E, Section 28	860 ft	0.5 acres
H-83-C	T14N, R25E, Section 28	865 ft	2.3 acres
H-83-L	T14N, R25E, Section 16	630 ft	7 acres
PSN 01	T15N, R26E, Section 28	810 ft	0.3 acres
PSN 04	T15N, R27E, Section 32	730 ft	5 acres
PSN 12/14	T14N, R27E, Section 24	840 ft	14 acres
PSN 72/82	T14N, R25E, Section 31	775ft	0.7 acres
PSN 90	T14N, R25E, Section 1	660 ft	5 acres
Bridge Overlook	T14N, R25E, Section 31	880 ft	2 acres
Igloo	T15N, R26E, Section 35	745 ft	1.2 acres

1 Elevation is in feet above mean sea level.



SOURCE USGS CORFU, WASH & LOCKE ISLAND, WASH PROVISIONAL EDITION, 1986

SCALE 1":2000'

LOCATION OF LANDFILL SITE
H-06-L (EAST AND WEST)

CDM FEDERAL PROGRAMS CORPORATION
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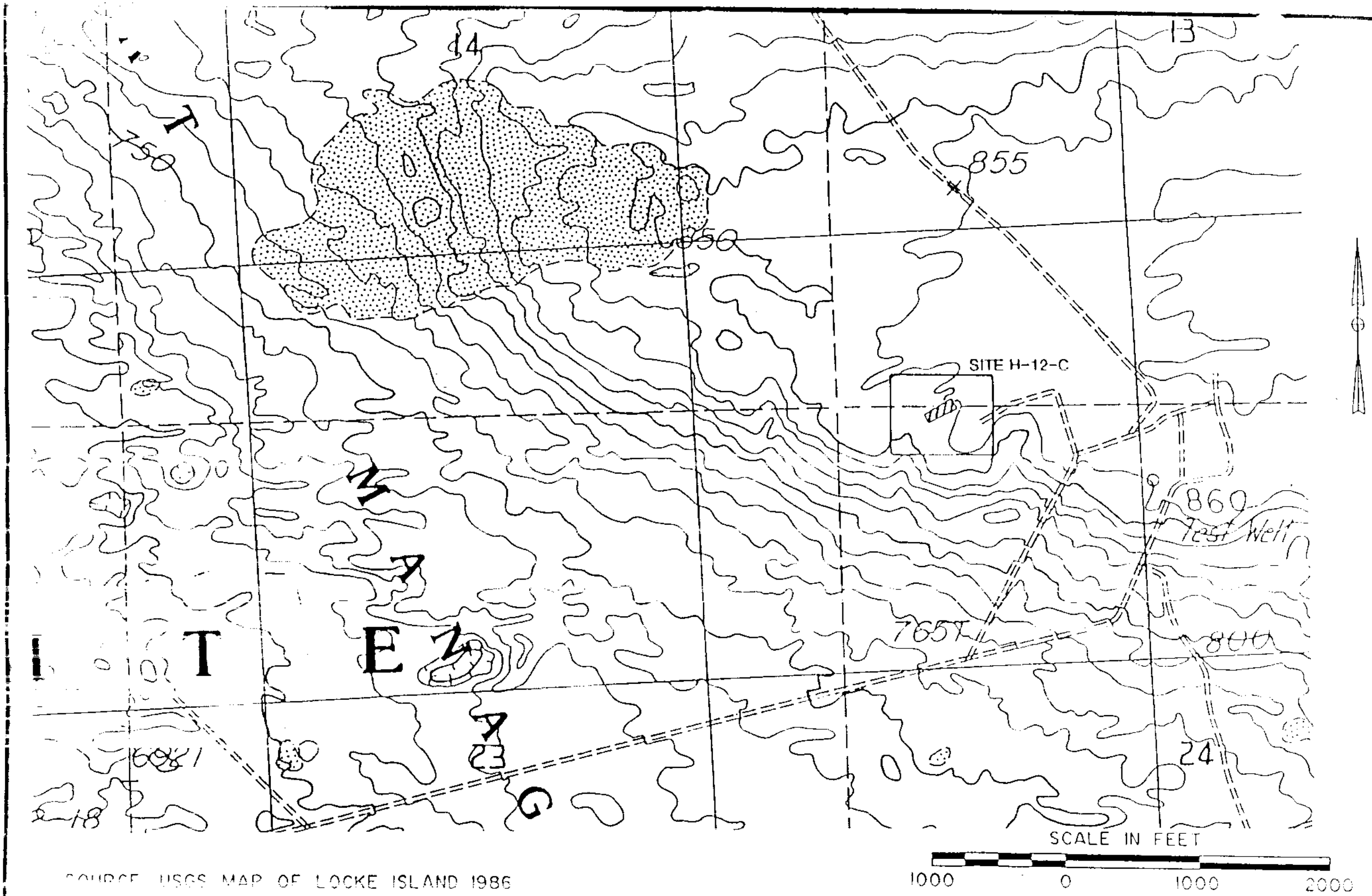
Figure No. 2-1



LOCATION OF SITE H-12-C

CDM FEDERAL PROGRAMS CORPORATION
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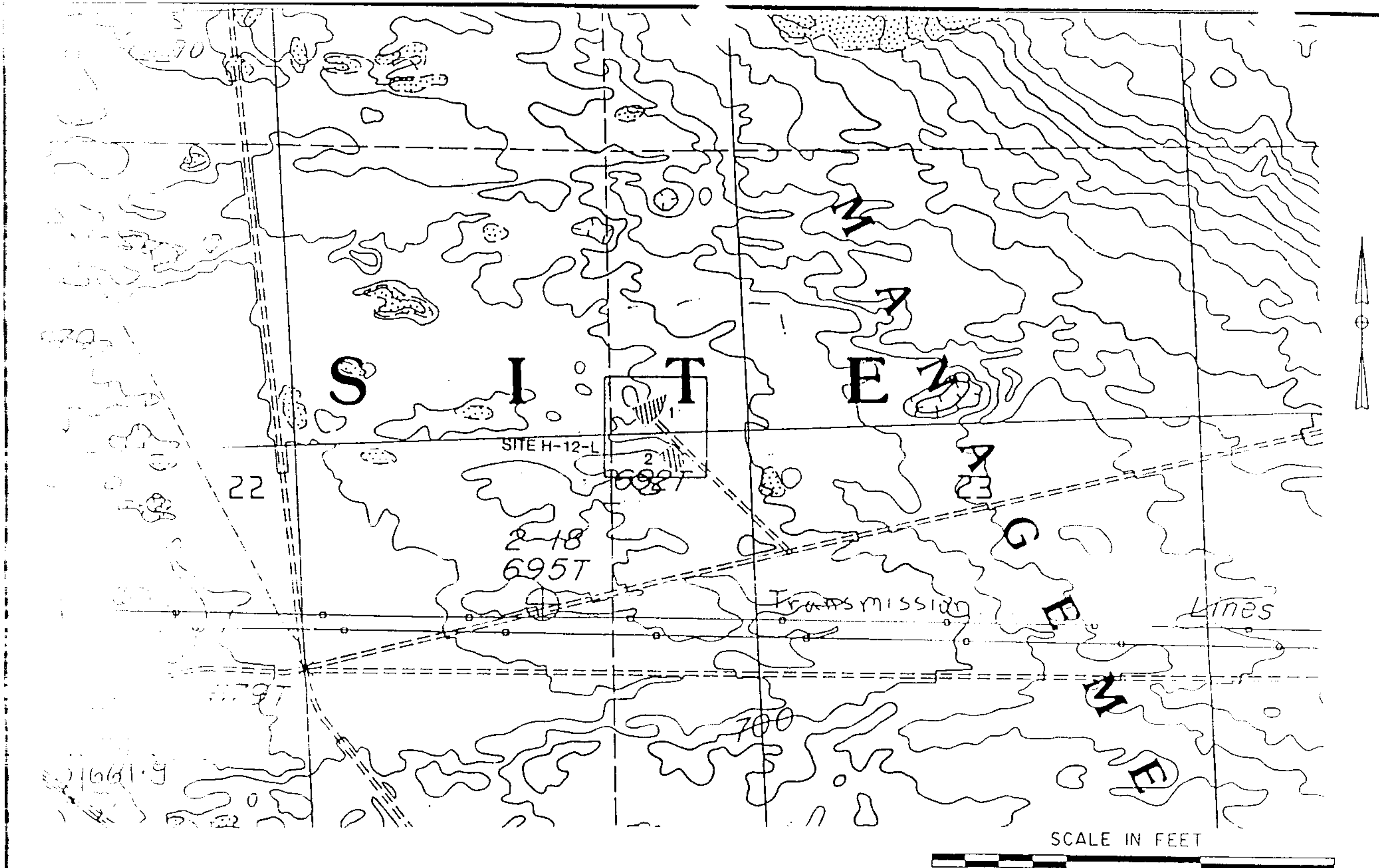
Figure No. 2-2



SOURCE USGS MAP OF LOCKE ISLAND 1986

LOCATION OF SITE H-12-L

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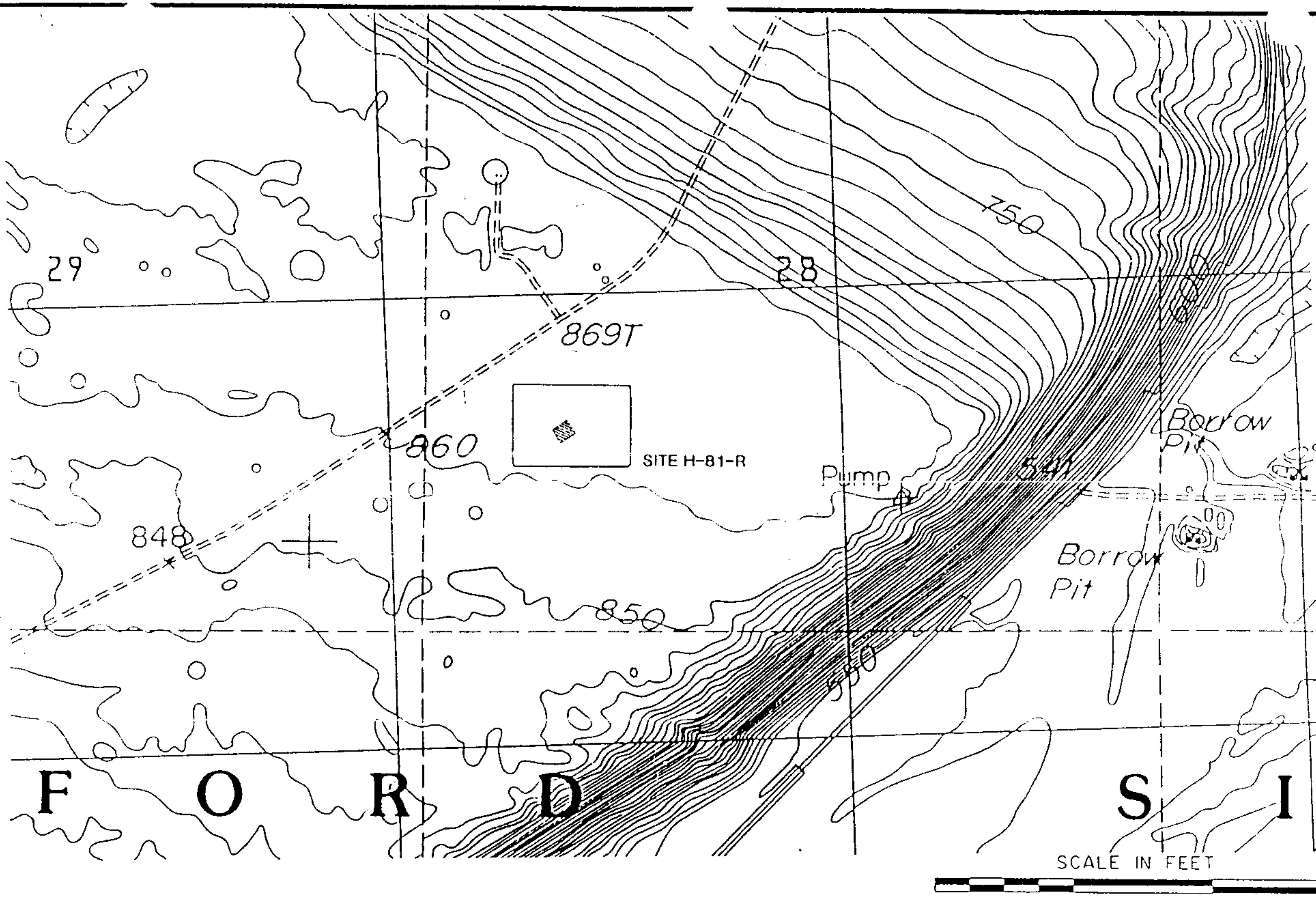
Figure No. 2-3



SOURCE: USGS MAP OF VERNITA BRIDGE 1986

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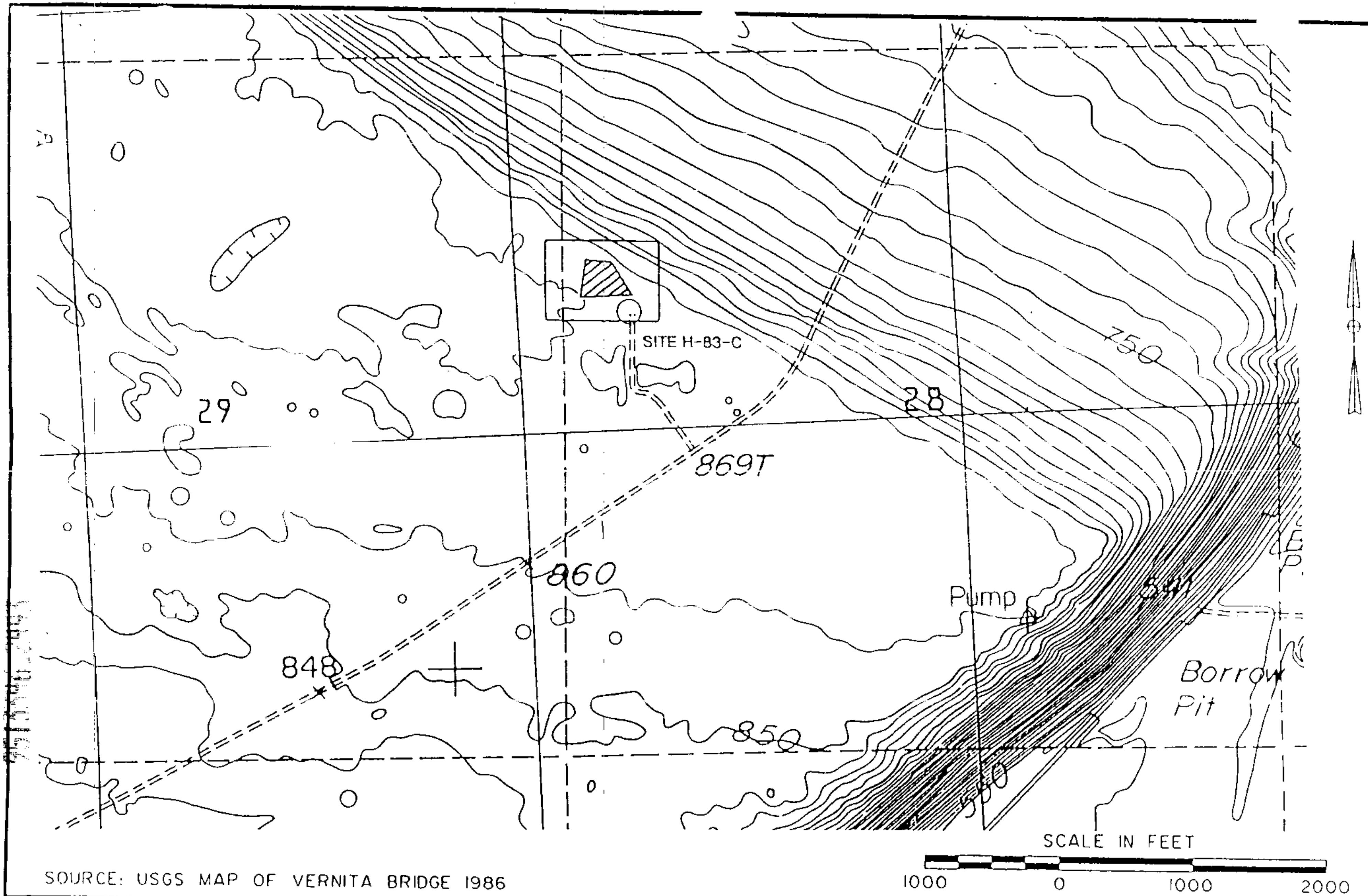
LOCATION OF SITE H-81-R

Figure No. 2-4



SOURCE: USGS MAP OF VERNITA BRIDGE 1986

LOCATION OF SITE H-83-C

CDM FEDERAL PROGRAMS CORPORATION
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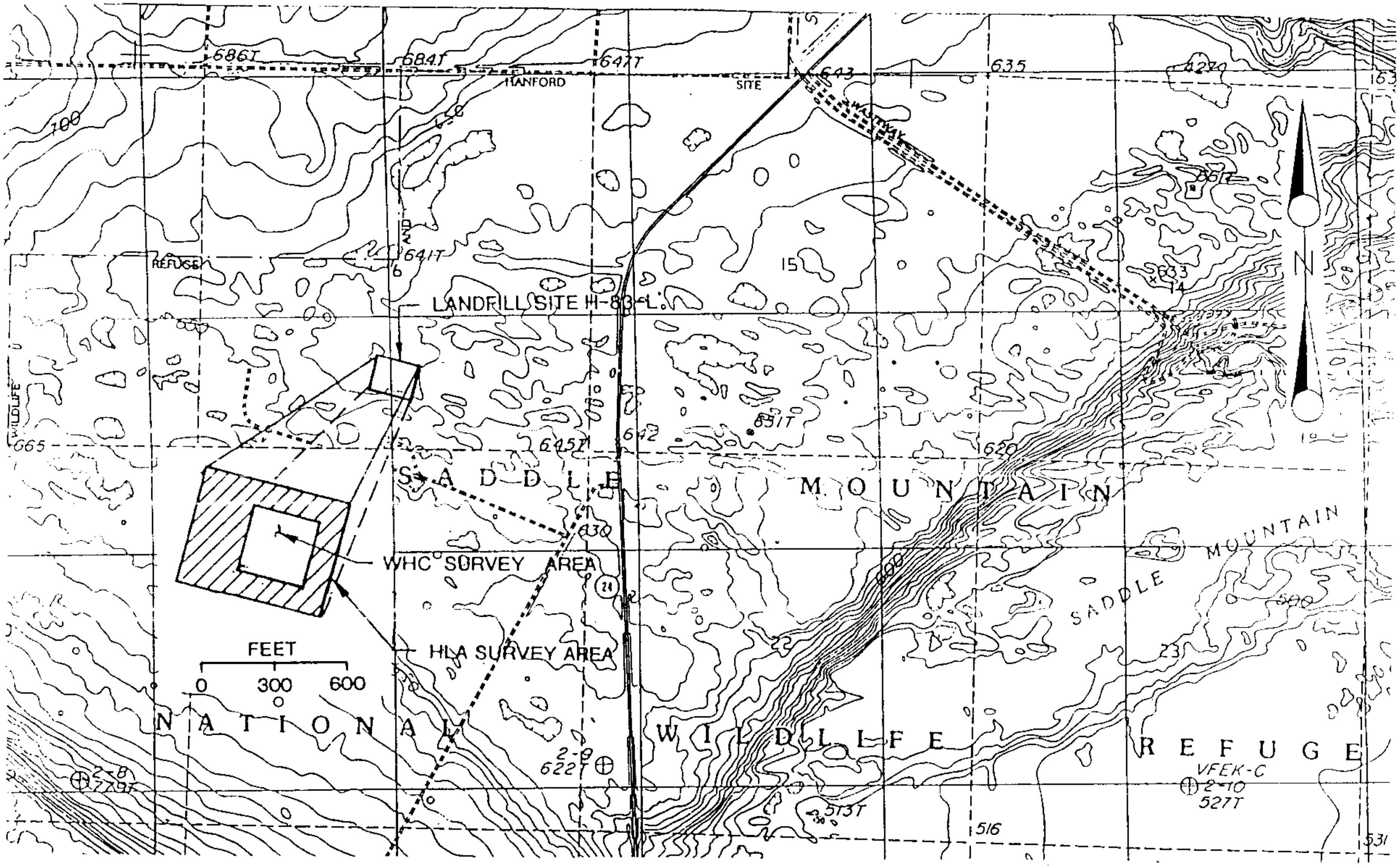
Figure No 2-5



MAP SOURCE USGS VERNITA BRIDGE, WASH PROVISIONAL EDITION, 1986

SCALE: 1"=2000'

LOCATION OF LANDFILL SITE H-83-L

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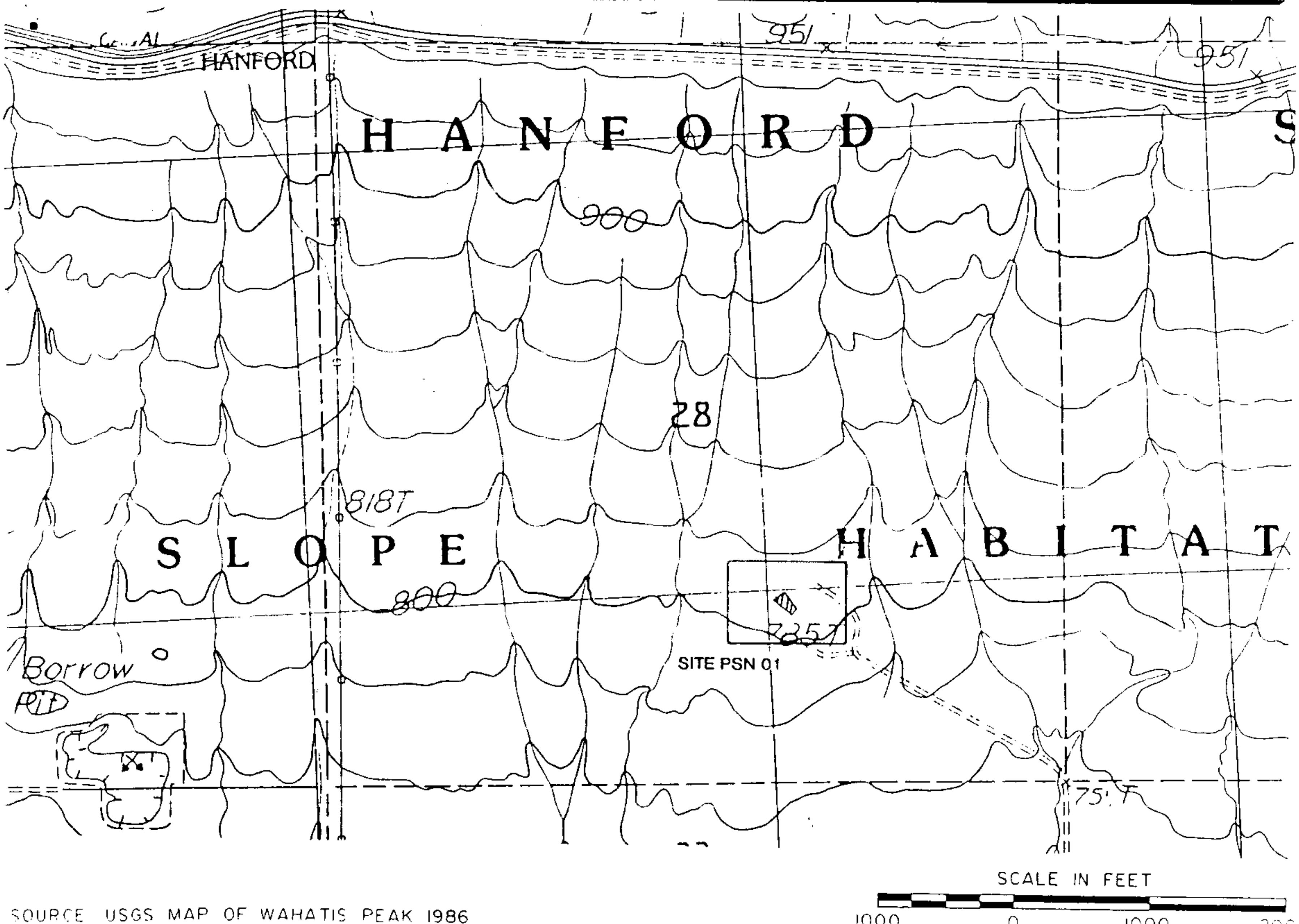

SOURCE USGS MAP OF WAHATIS PEAK 1986

LOCATION OF PSN 01

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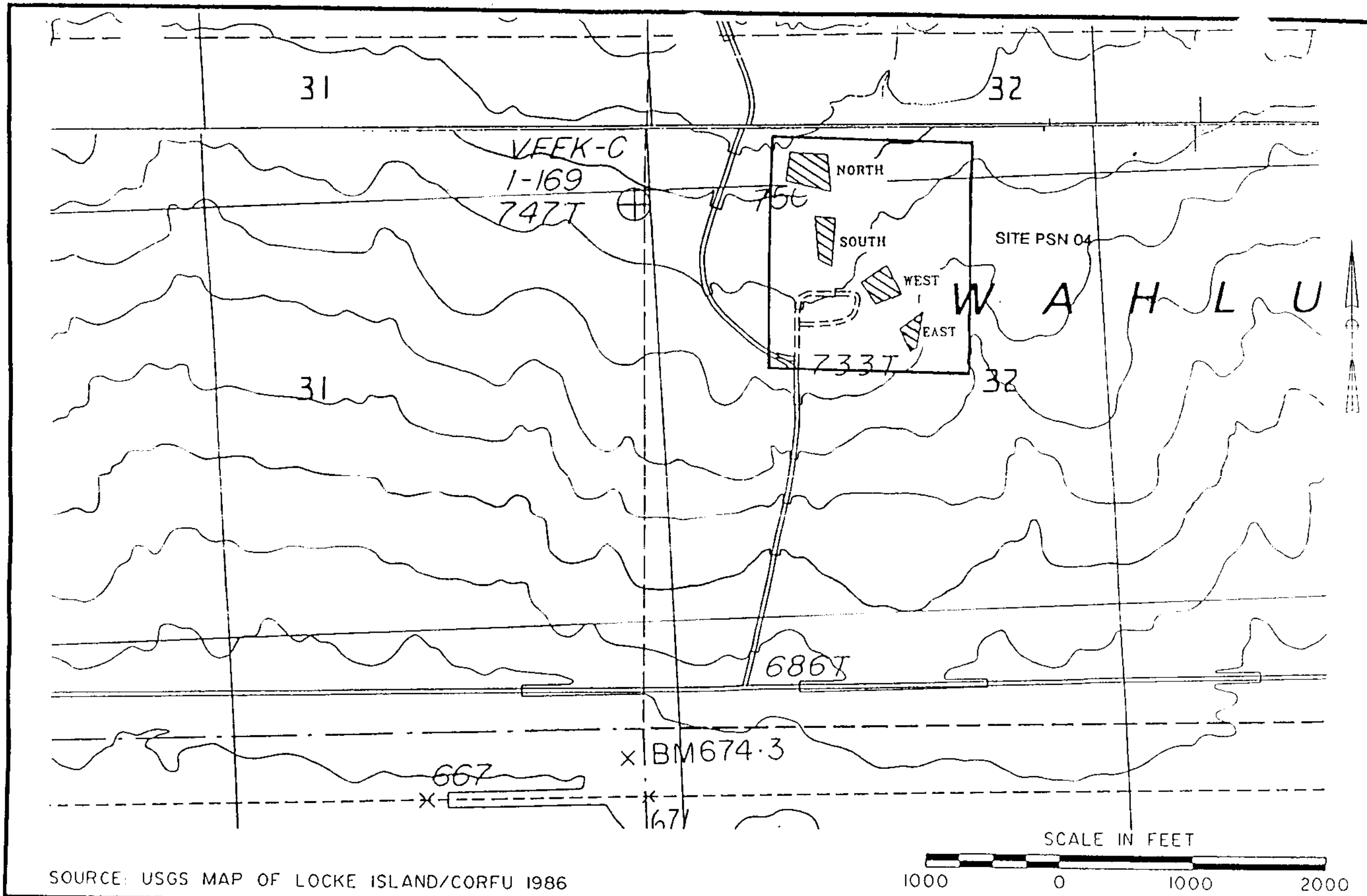

SOURCE: USGS MAP OF LOCKE ISLAND/CORFU 1986

CDM FEDERAL PROGRAMS CORPORATION
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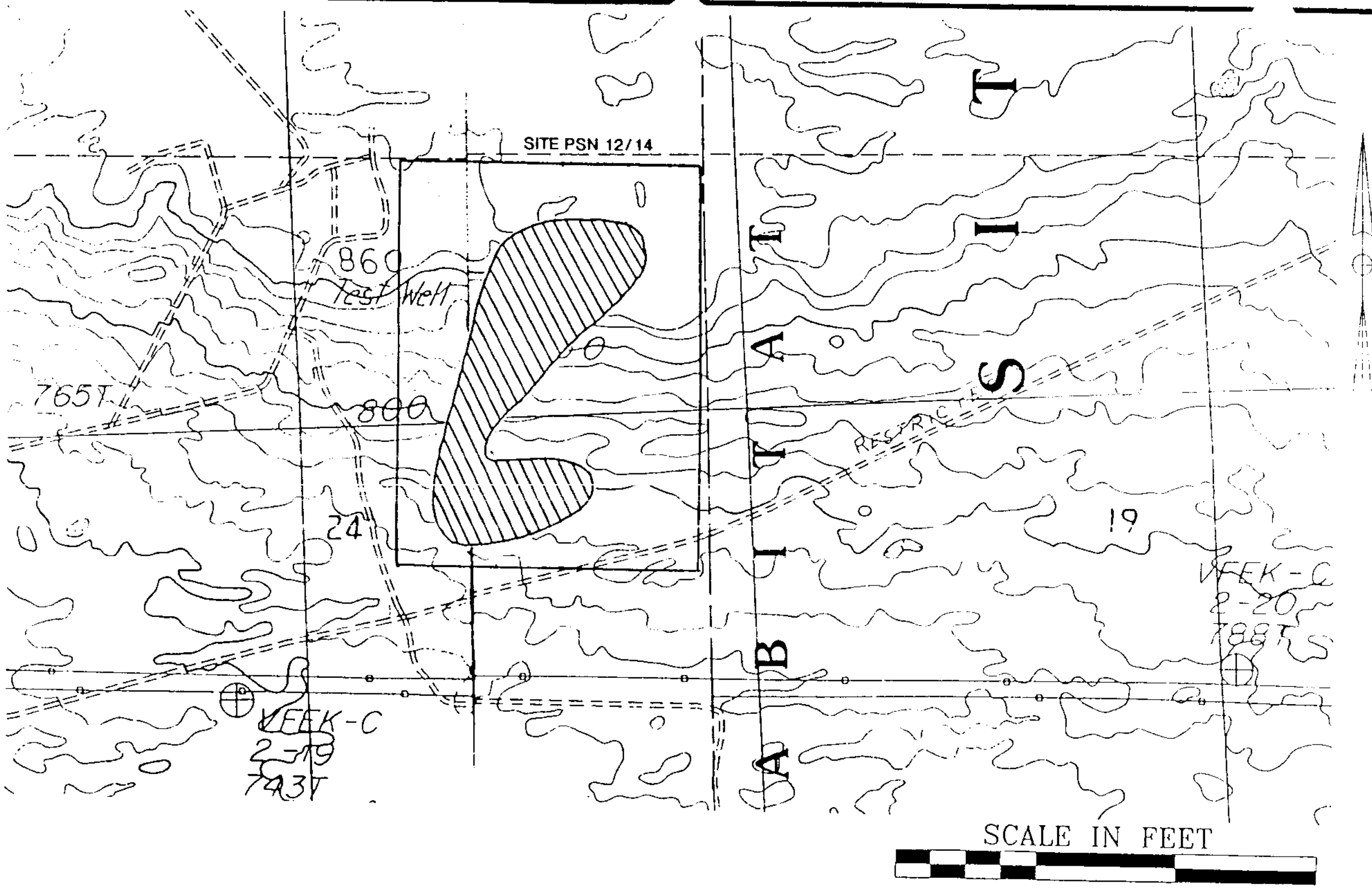
LOCATION OF SITE PSN 04

Figure No 2-8



SOURCE: USGS MAP OF LOCKE ISLAND 1986

LOCATION OF SITE PSN 12/14

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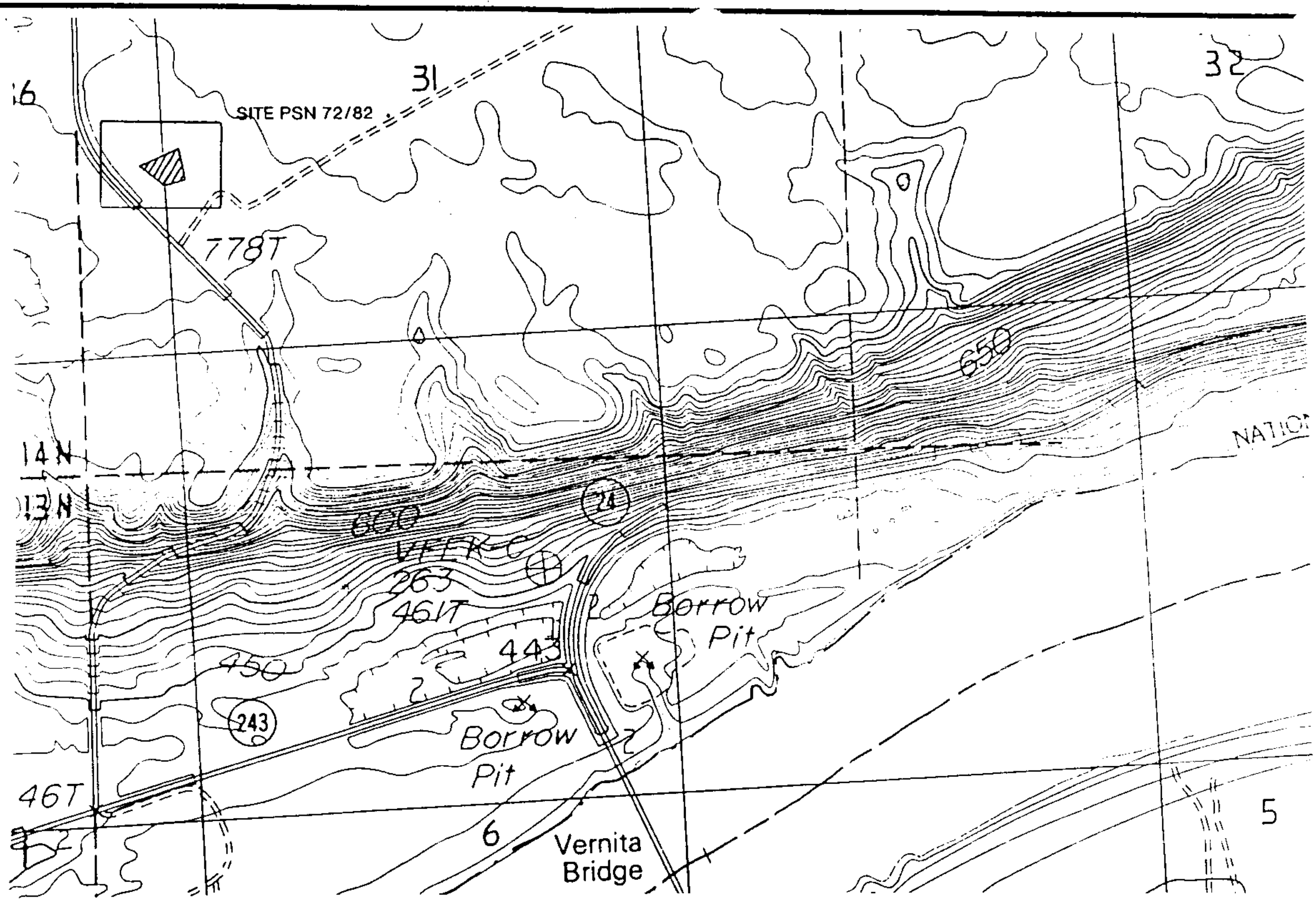

SOURCE: USGS MAP OF VERNITA BRIDGE 1986

SCALE IN FEET

1000 0 1000 2000

LOCATION OF PSN 72/82

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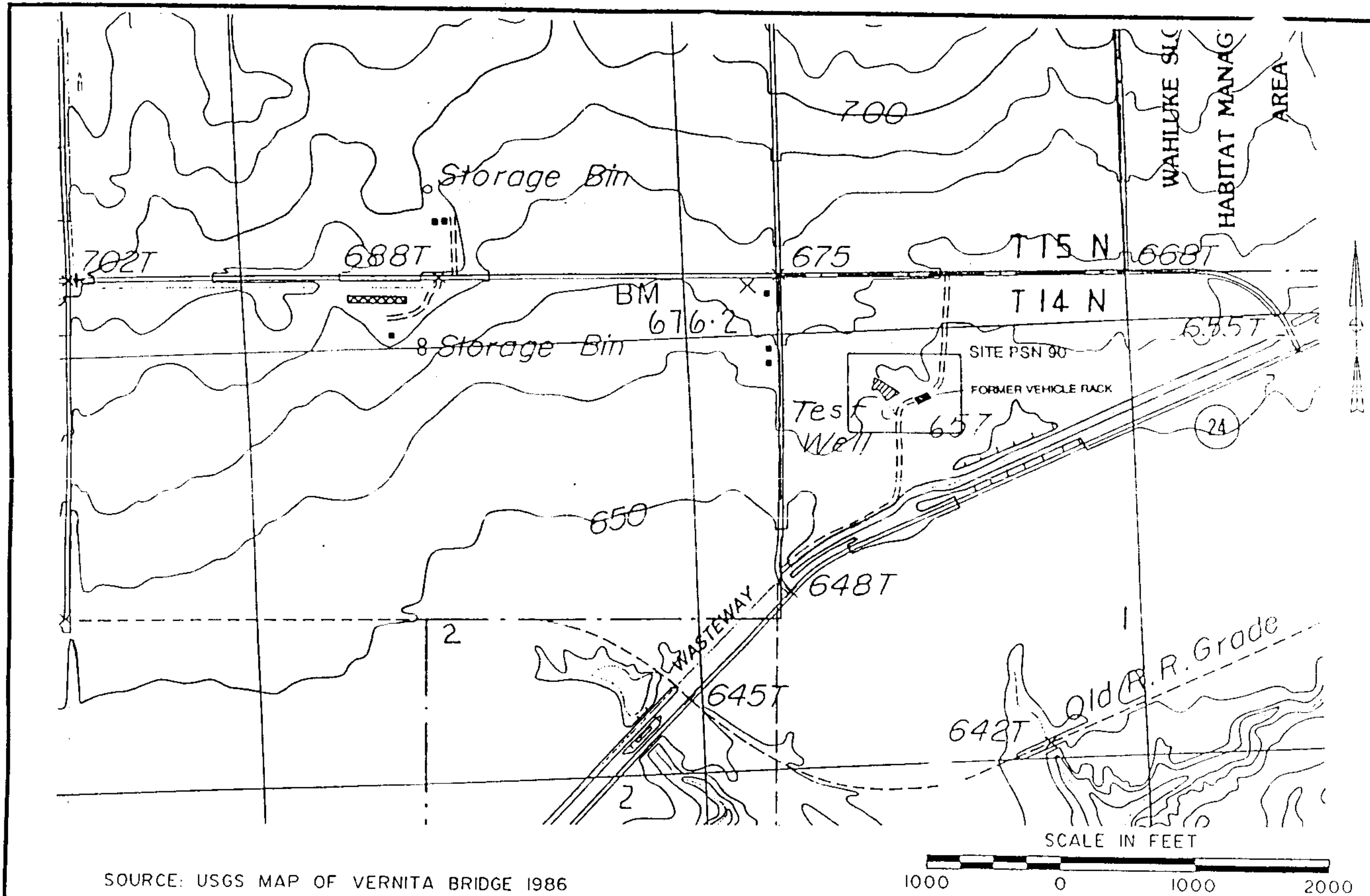

LOCATION OF SITE PSN 90

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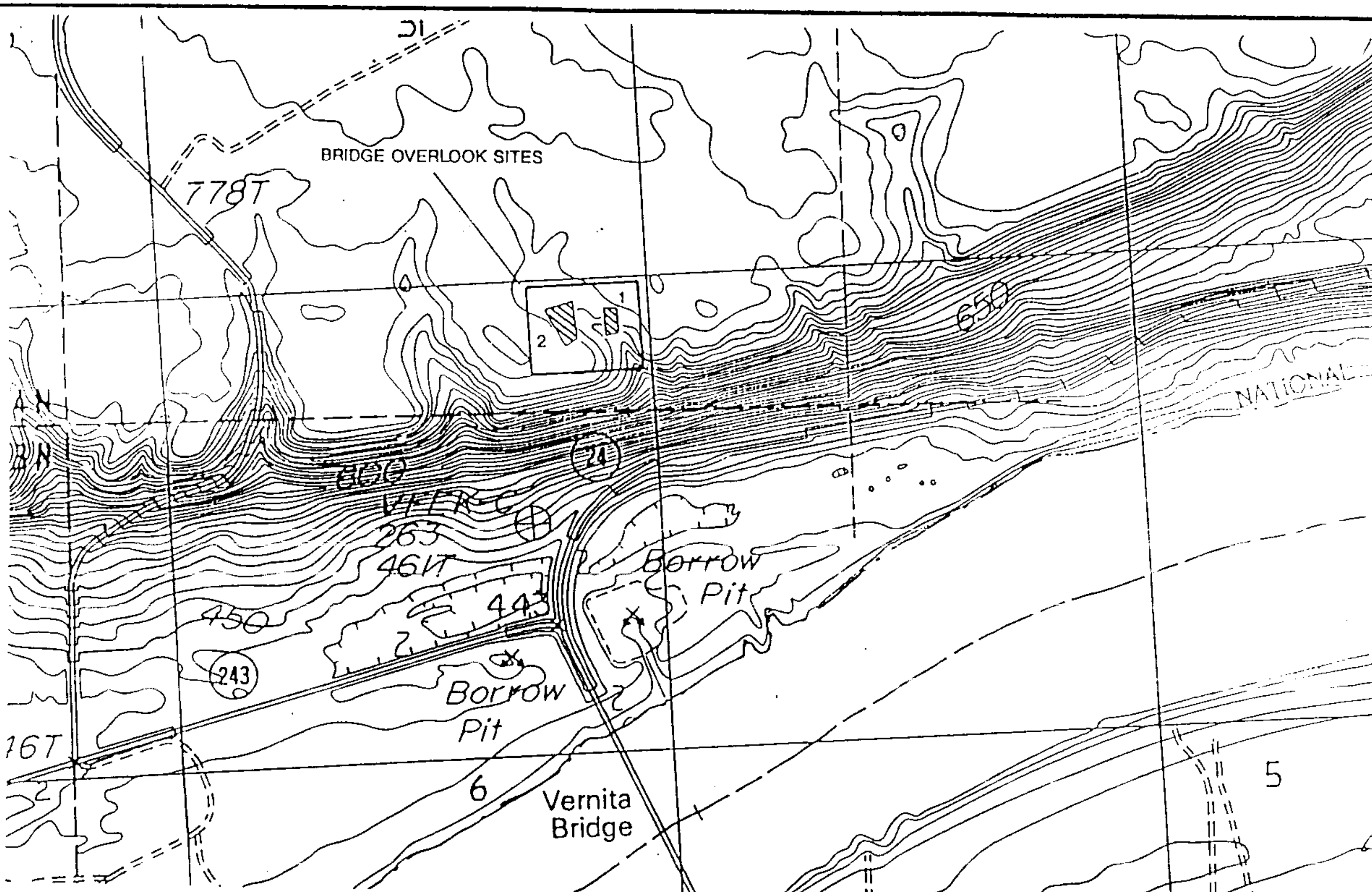
Figure No. 2-11



SOURCE: USGS MAP OF VERNITA BRIDGE 1986

SCALE IN FEET

1000 0 1000 2000

LOCATION OF BRIDGE OVERLOOK SITES

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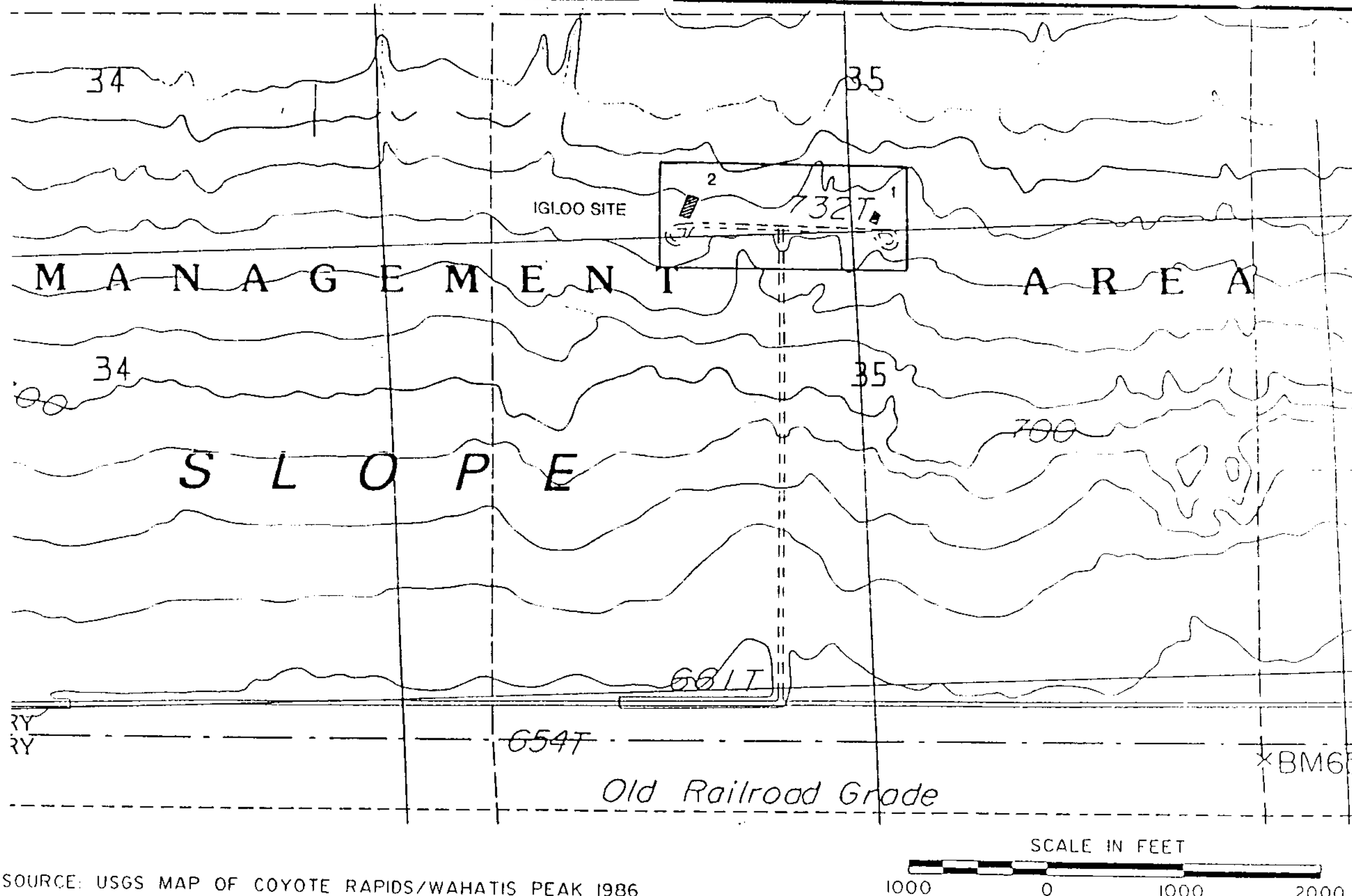
Figure No. 2-12



SOURCE: USGS MAP OF COYOTE RAPIDS/WAHATIS PEAK 1986

LOCATION OF IGLOO SITES

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Figure No 2-13

More recently, the North Slope area has been managed by the state and federal governments as wildlife habitat. The western portion is supervised by the U.S. Fish and Wildlife Service as the Saddle Mountain National Wildlife Refuge. The State of Washington oversees the eastern portion as the Wahluke Slope Habitat Management Area. Increased public access to these areas has resulted in indiscriminate dumping of refuse including demolition debris, household refuse, and waste motor oil. This dumping is most evident at the previously developed military sites and predominantly within the Wahluke Slope Habitat Management Area where access is less restricted.

2.3 PREVIOUS INVESTIGATIONS

Two previous investigations have been conducted at the North Slope sites. The first involved a background review and a site reconnaissance to identify potential hazardous materials release sites (WHL 1990). The second involved surface geophysical investigations of several of the sites to identify buried wastes (WHL 1992).

3.0 FIELD ACTIVITIES

Field investigations of the Hanford North Slope landfill sites included geophysical surveys, trenching and waste excavation, and subsurface soil sampling and analysis. Technical approach and methods employed are summarized below. A more detailed description of approach and methods is presented in the site work plans (CDM Federal 1994a-g).

3.1 GEOPHYSICAL SURVEYS

Geophysical surveys of the North Slope sites consisted of two different tasks: (1) verification of buried waste locations as determined by previous investigations, and (2) surface geophysical surveys in previously uninvestigated areas. The H-06-L, H-83-L, and PSN 04 Sites were the subject of previous geophysical surveys by others (WHC 1992). The area of the surveys at the H-06-L and H-83-L Sites were enlarged as part of the current investigation. New surveys were conducted at each of the other sites except PSN 04. Geophysical survey areas were delineated in the field by the USACE based on disturbed earth, stressed vegetation, presence of debris at the surface, and historical information.

Two geophysical techniques were utilized: electromagnetic profiling (EM) and magnetics (MAG). These techniques were selected to provide information on the presence of buried metal, changes in soil conductivity, and buried objects. Both EM and MAG can identify buried ferrous metal. In addition, EM can also detect changes in soil conductivity that might indicate the presence of non-ferrous metal or other construction materials expected to be present in the landfill. In addition, a Fisher M-Scope pipe and cable locator was used to identify shallow metal objects to fine-tune the interpretation and delineation of landfill material. Geophysical equipment and methods are summarized in the following sections and described in more detail in the geophysical survey reports included as Appendix A.

3.1.1 GEOPHYSICAL EQUIPMENT

The MAG system consists of two EG&G Geometrics, Inc. Model G-856 proton precession gradient magnetometers. One magnetometer is placed in a fixed location and is used to monitor naturally occurring variations in the earth's magnetic field. The field instrument, which is carried along the survey transects, has enhanced memory and is capable of storing nearly 10,000 measurements in memory.

The EM system consists of Geonics Limited Model EM31-D terrain conductivity meter connected to both a digital data logger and a two-channel chart recorder. The analog chart recorder output allows the geophysicist to continuously monitor the EM response while walking along the survey transects. This method of EM data collection has the advantage of facilitating rapid recognition of areas of anomalous response that may require an extension of the survey area or more closely spaced survey transects. Moreover, preliminary EM anomaly maps can be quickly prepared without computer manipulation of data. The digital data are returned to the office for processing and computer contouring.

A second electromagnetic detector, the Fisher Research Laboratory model TW-6-M-Scope pipe and cable locator, was also used during this investigation. This unit does not have a recording function, but it produces an audible signal when held within approximately 4 feet of metal objects. It is useful for quickly delineating areas of shallow buried metal.

3.1.2 SURVEY PROCEDURES

Geophysical investigations at the H-06-L, H-83-L, and PSN 04 sites began with verification of previously identified buried waste locations (geophysical anomalies). At each anomaly, the M-Scope and EM31-D instruments were used to delineate areas suspected of containing metallic or non-metallic debris. Areas of anomalous response were marked on the ground with paint to assist excavation efforts.

For sites not previously investigated using geophysical methods, a horizontal control grid was established prior to conducting geophysical surveys. A 20-foot grid pattern was established in the survey areas using a survey transit and fiberglass tape measure. The grid spacing was chosen to provide the necessary detail of the survey and to match the grid spacing of previous surveys on the North Slope. The grid points were labeled and marked by combination of wooden survey lath and PVC pin flags. The survey transects were referenced to the previous survey grid, if present.

Before conducting the geophysical surveys, operational checks were made on all functional components of the geophysical systems, and each system was tuned to local conditions according to the manufacturer's operations manual. A calibration point for the EM and a MAG base station location was established in an area of native soil near each site. EM system calibration and magnetometer tuning was performed before each day's data collection.

EM data were collected along transects spaced 20 feet apart; continuous, two-channel analog EM data were obtained using the chart recorder. In addition, the two components of the EM signal were obtained at one-second intervals by the digital data logger. MAG data were collected along transects spaced 20 feet apart with magnetic gradient readings taken every 10 feet along the survey transects. The MAG transects were offset 10 feet from the EM transects, resulting in a 10-foot transect spacing for the entire geophysical survey.

After geophysical data were collected and reviewed for each site, a preliminary anomaly location map was prepared. These areas of anomalous response were then resurveyed and detailed to finalize locations and dimensions and to identify variations in instrument response. These variations typically represented single large metallic objects (crushed drums, vehicles, steel cable) or more shallowly buried debris. Preliminary site maps and field markings assisted in guiding the excavation of waste materials.

3.2 TRENCHING/WASTE EXCAVATION ACTIVITIES

The first North Slope site to be investigated under the current project was the H-06-L Landfill Site. Because the types and volumes of buried wastes were unknown, USACE, DOE, and the regulatory agencies agreed that each area of anomalous geophysical response would be excavated in its entirety. Forty-four anomalies were excavated until the full depth and lateral extent of waste materials was reached. Following the completion of the H-06-L site investigation, the technical approach used was reviewed by the USACE, DOE, EPA, and the Washington State Department of Ecology. It was decided that the approach to excavation of anomalies would be modified for the remaining North Slope sites. The modified approach consisted of "limited trenching" or the excavation of exploratory trenches through each anomaly. These trenches were 5 to 10 feet wide and were typically oriented along the long axis of each anomaly. The shape or dimensions of some anomalies made it necessary to excavate several exploratory trenches. The depth of each exploratory trench was advanced until undisturbed native soils were encountered. If suspect hazardous materials were encountered, excavation proceeded until all such materials were removed.

With the exception of the change in trenching approach described above, excavation activities were conducted similarly at each site. The work sequence was as follows:

- Suspected landfill areas (and anomaly locations at sites where geophysical surveys had been conducted previously) were surveyed and staked by the USACE.

- Previously identified geophysical anomalies were verified and geophysical surveys were conducted in areas identified by the USACE. Anomaly locations were marked in the field.

- Landfill caps were removed from larger anomalies with a D7H Caterpillar bulldozer and soil was stockpiled for the subsequent closure of the excavated area.

- A Hitachi 07 trackhoe (equipped with a 1 or 2 cubic yard (cy) capacity bucket) was utilized to excavate buried wastes.

- Excavated materials were screened visually, by field instruments (Photoionization Detector [PID] or Flame Ionization Detector [FID]), and by field test kits (Enviroguard™ kits for chlorinated compounds and for DDT and Hanby™ kit for petroleum hydrocarbons).

- All excavated materials were inventoried. Potentially hazardous materials were segregated.

- All stockpiled potentially hazardous materials/soils were underlain and covered with minimum 6-mil visqueen or on USACE-furnished Port-a-Pads.

- At the direction of the USACE, samples of potentially hazardous materials and confirmation samples of "clean" soil were obtained by CDM Federal personnel and sent to a USACE-certified offsite analytical laboratory for analysis.

- Trench excavation concluded when onsite analysis (and offsite laboratory confirmation) indicated that hazardous materials and contaminated soil exceeding cleanup standards determined by the Washington Department of Ecology had been removed.

- Prior to backfilling, information regarding each trench was recorded including: the site number, trench number, trench dimensions and an inventory of waste types excavated.

- After excavation the trench was backfilled with non-hazardous landfill wastes and cover material, compacted, and regraded to the surrounding ground level.

- Clean fill material obtained from offsite sources was used in some cases. All fill materials were sampled and analyzed before being brought onsite.

3.3 SUBSURFACE SOIL SAMPLING

At the direction of USACE, CDM Federal collected subsurface soil/debris samples (including background soil samples and soil samples from areas of stressed vegetation) during the excavation of geophysical anomalies at the North Slope sites. Sample collection, identification, labeling, packaging and shipping followed the procedures outlined in the Work Plan Landfill Characterization and Remediation, Site H-06-L, Hanford North Slope Washington and Addenda (CDM Federal 1994a-g). A field coding system was used to identify each sample during the sampling program. Subsurface samples for offsite analysis were numbered according to the following system:

Example sample number: 94PSN90-A02-01-002

94	=	<u>Year designator</u>: 1994
PSN90	=	<u>Site location</u>: PSN 90; alternatively,
H06L(E)	=	Site H-06-L East
H06L(W)	=	Site H-06-L West
H83L	=	Site H-83-L
PSN 04	=	Site PSN 04
H12L	=	Site H-12-L
IGL	=	Igloo Site
H83C	=	Site H-83-C

BOV2	=	Site Bridge Overlook 2
1214	=	Site PSN 12/14
A02	=	Sample source: Anomaly A-2; alternatively,
CS1	=	Clean soil for fill material, Sample Location 1
BG1	=	Background sample location 1
BKG	=	Background sample
DS	=	Drum sample
VR	=	Vehicle rack
SV	=	Stressed vegetation area
01	=	Sampling Location: 1
002	=	Sample depth/type: 2 feet below ground surface, alternatively
EB1	=	Equipment rinsate blank
TB1	=	Trip Blank

Laboratory analyses conducted on soil/debris samples included one or more of the following analytical methods: volatile organic compounds (SW-846 Method 8260), semi-volatile organic compounds (SW-846 Method 8270), pesticides/PCBs (SW-846 Method 8080), 8 RCRA metals (SW-846 Methods 6010/7000 Series) and total petroleum hydrocarbons (WTPH-HCID, WTPH-G, WTPH-D, and 418.1W). A complete description of the numbers and types of samples collected, including QA/QC samples, is presented in Section 4.0.

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4.0 RESULTS

The following section presents the results of the geophysical surveys, trenching/excavation activities and subsurface soil sampling conducted at the Hanford North Slope sites.

4.1 GEOPHYSICAL SURVEY RESULTS

Geophysical surveys of the Hanford North Slope sites were performed by CDM Federal subcontractor Harding Lawson Associates (HLA). Survey results are summarized below. A more detailed discussion is presented in the geophysical survey reports in Appendix A.

4.1.1 H-06-L SITE

Geophysical survey information for much of the H-06-L Site is available from earlier site investigations (WHC 1992). Areas covered under these earlier investigations were extended to cover adjacent, suspect areas during the current characterization effort. EM and MAG surveys were conducted in three areas on a 20-foot grid spacing interval over an area of approximately 7.8 acres. Figure 4-1 is a location map of the H-06-L Site showing the areas surveyed and the new anomalies found from these surveys. The six new EM and MAG anomalies identified in Figure 4-1 and one (A-23) located on Figure 4-2 indicate disposal cells (demolition debris, refuse and metallic debris) not identified by the previous geophysical studies (WHC 1992). The earlier investigation resulted in 37 anomalous areas marked in the field. Figures 4-2 and 4-3 portray anomalies from both current and previous investigations. Each anomaly was excavated, and the waste types were inventoried. Results of all excavation/trenching activities are summarized in Section 4.2. The geophysical interpretation maps obtained from the EM and MAG surveys are included in Appendix A.

4.1.2 H-12-C SITE

An area of approximately 50 feet by 200 feet at the H-12-C Site was subject to geophysical surveys using both EM and MAG. This survey encompassed a linear depression suspected of being a waste burial area. Figure 4-4 shows the area surveyed. No areas of anomalous geophysical response were detected. A slight increase in terrain conductivity near the center of the linear depression can probably be attributed to higher moisture content. As a result of the geophysical surveys, no further investigations were conducted at the H-12-C Site.

4.1.3 H-12-L SITE

Geophysical surveys of the H-12-L Site covered two separate areas, H-12-L-1 and H-12-L-2. The first area, H-12-L-1, is a rectangular depression with approximately 15 feet of relief. A survey grid of about 140 feet by 220 feet was established at this site. The H-12-L-2 Site is a broad grassy area of about 80 feet by 120 feet.

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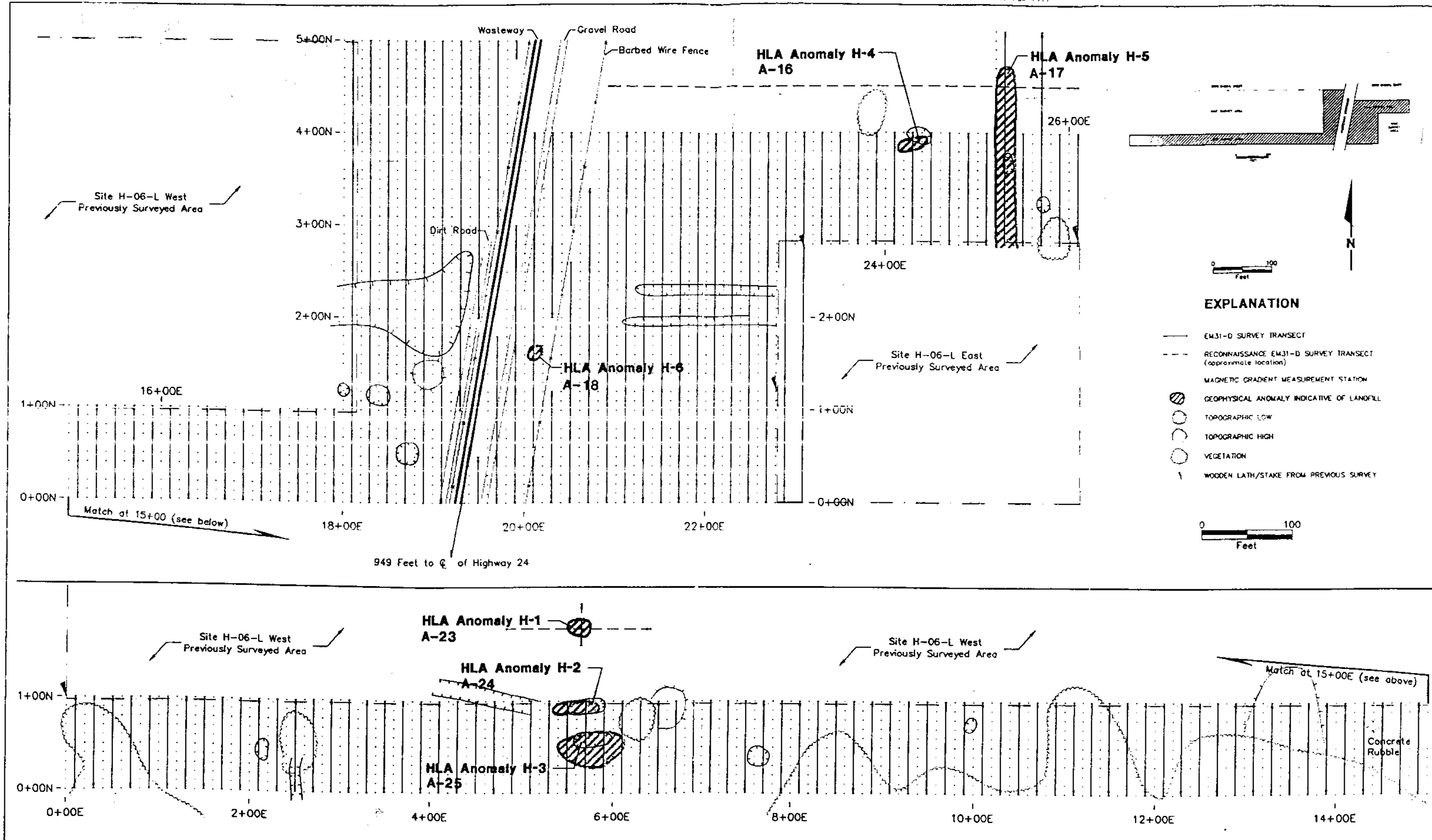

3/94

HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-06-L (EAST AND WEST)

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure 4-1

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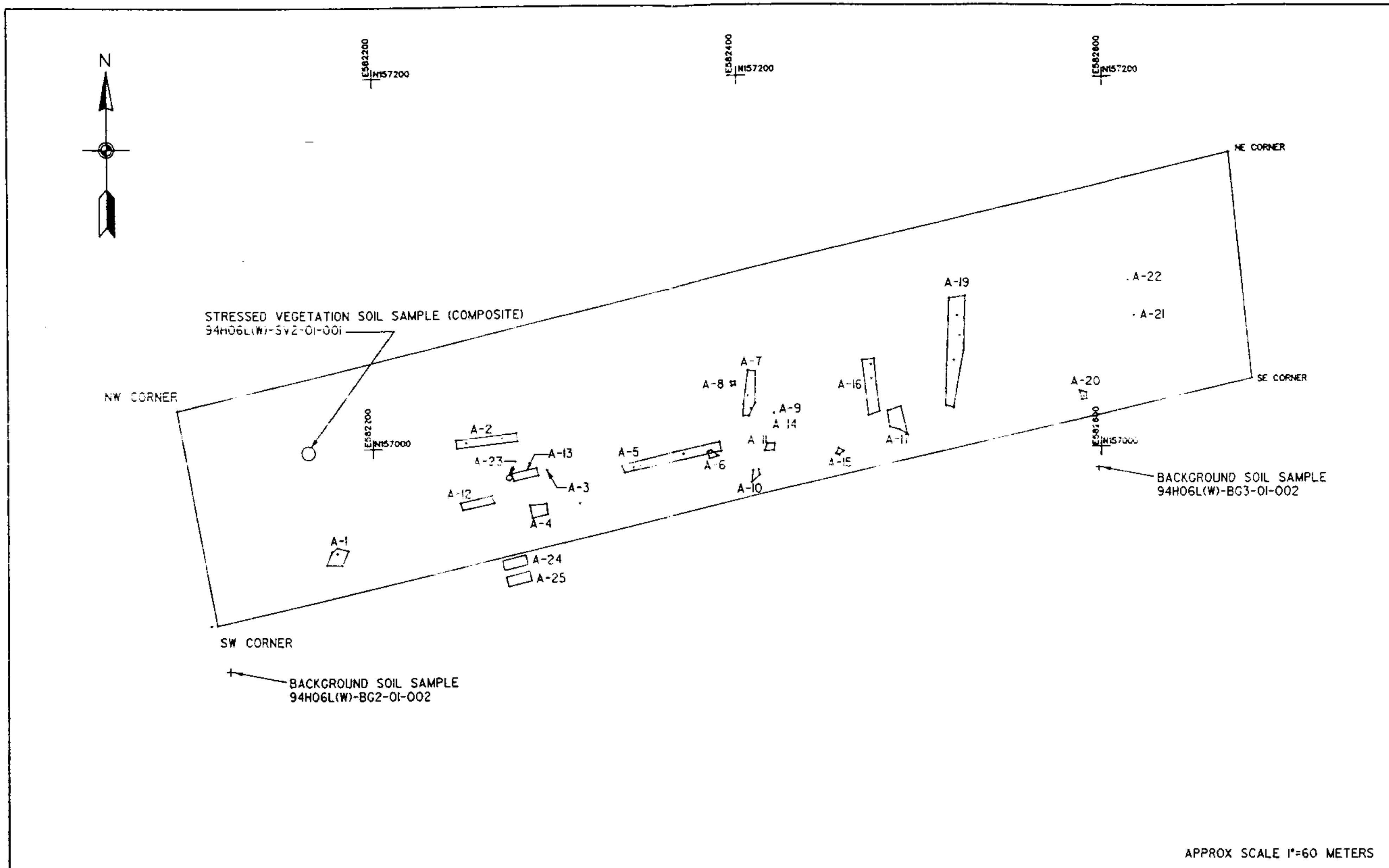

7/94

HANFORD NORTH SLOPE
SITE MAP WITH GEOPHYSICAL INTERPRETATION
LANDFILL SITE H-06-L WEST (WHC, 1992 HLA, 1994)

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure 4-2

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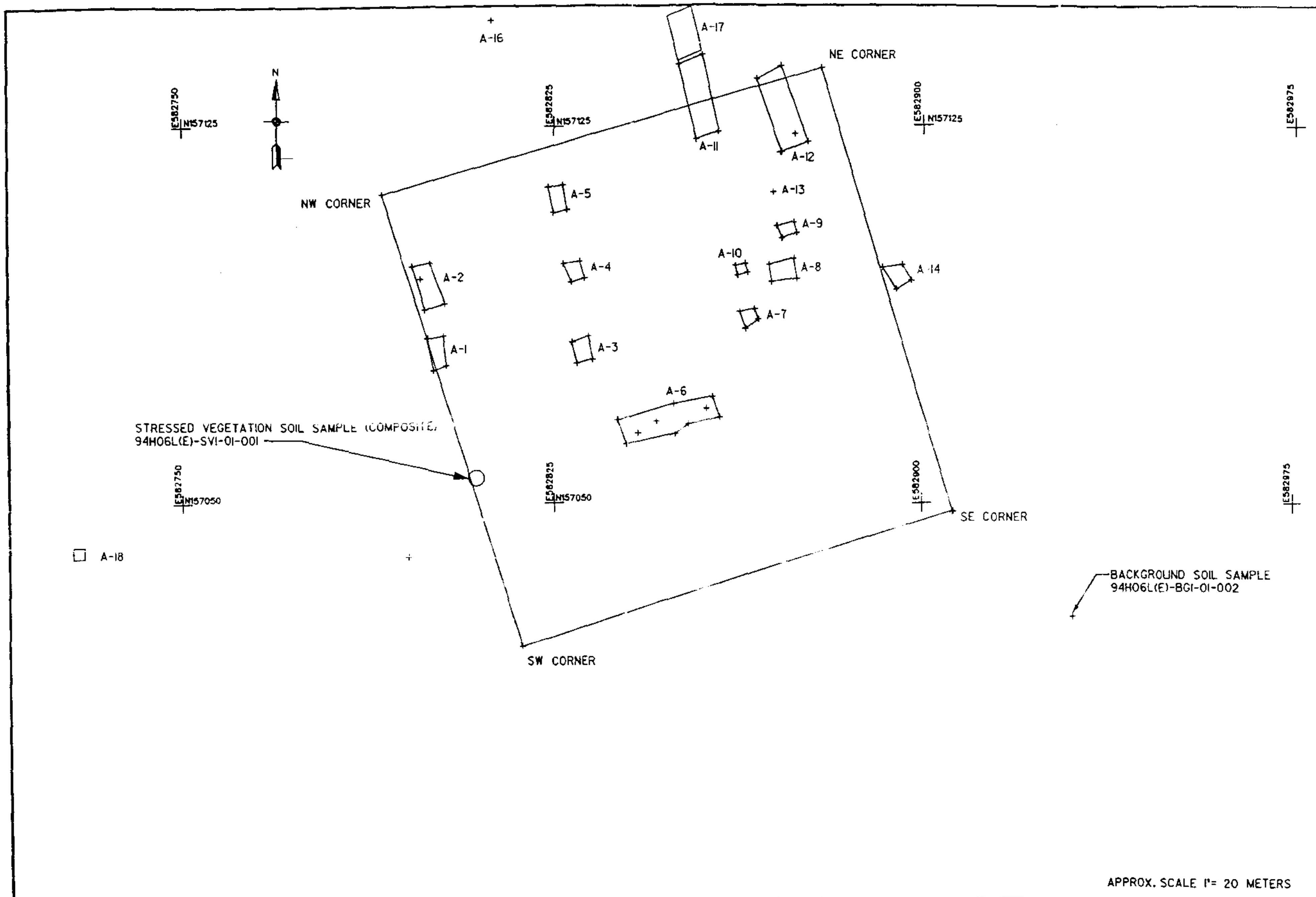

7/94

HANFORD NORTH SLOPE
SITE MAP WITH GEOPHYSICAL INTERPRETATION
LANDFILL SITE H-06-L EAST (WHC, 1992 AND HLA, 1994)

CDM FEDERAL PROGRAMS CORPORATION

Figure 4-3

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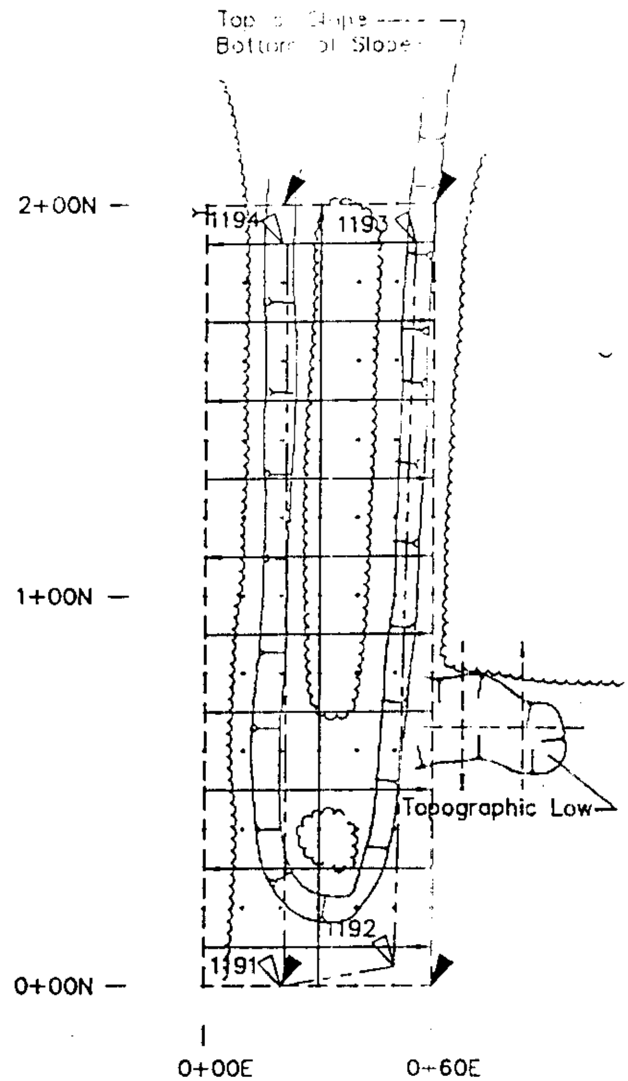
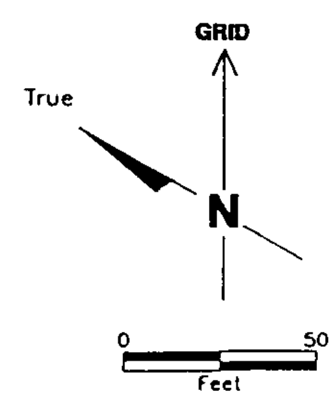
Geophysical Survey Coverage



EXPLANATION

- EM31–D SURVEY TRANSECT
- RECONNAISSANCE EM31–D SURVEY TRANSECT
- MAGNETIC GRADIENT MEASUREMENT STATION
- DATA POINT USED FOR CONTOURING
- US ARMY COE SITE BOUNDARY
- HLA SURVEY AREA BOUNDARY
- SURVEY LATH INSTALLED BY HLA
- 1191 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER



NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE

CDM FEDERAL PROGRAMS CORPORATION
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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-12-C

Figure No. 4-4

Figure 4-5 is a map of the H-12-L-1 Site depicting the single geophysical anomaly detected at this site. Figure 4-5 also shows topographic features of the site and vegetation at H-12-L-1. Figure 4-6 is a map of the H-12-L-2 Site depicting the area investigated. Figure 4-6 also shows topographic features of the site and vegetation at H-12-L-2. No areas of anomalous geophysical response were detected at this site. No additional investigation was conducted at the H-12-L-2 Site.

4.1.4 H-81-R SITE

Geophysical investigations at the H-81-R Site covered an area of 160 feet by 180 feet (Figure 4-7). The area surveyed was sparsely vegetated and the terrain relatively flat. No geophysical anomalies were detected within the survey area. However, a reconnaissance survey consisting of two perpendicular transects at a low mound 175 feet north of the survey area indicated the presence of buried debris. This single anomaly was characterized by a response on both EM and MAG instruments.

4.1.5 H-83-C SITE

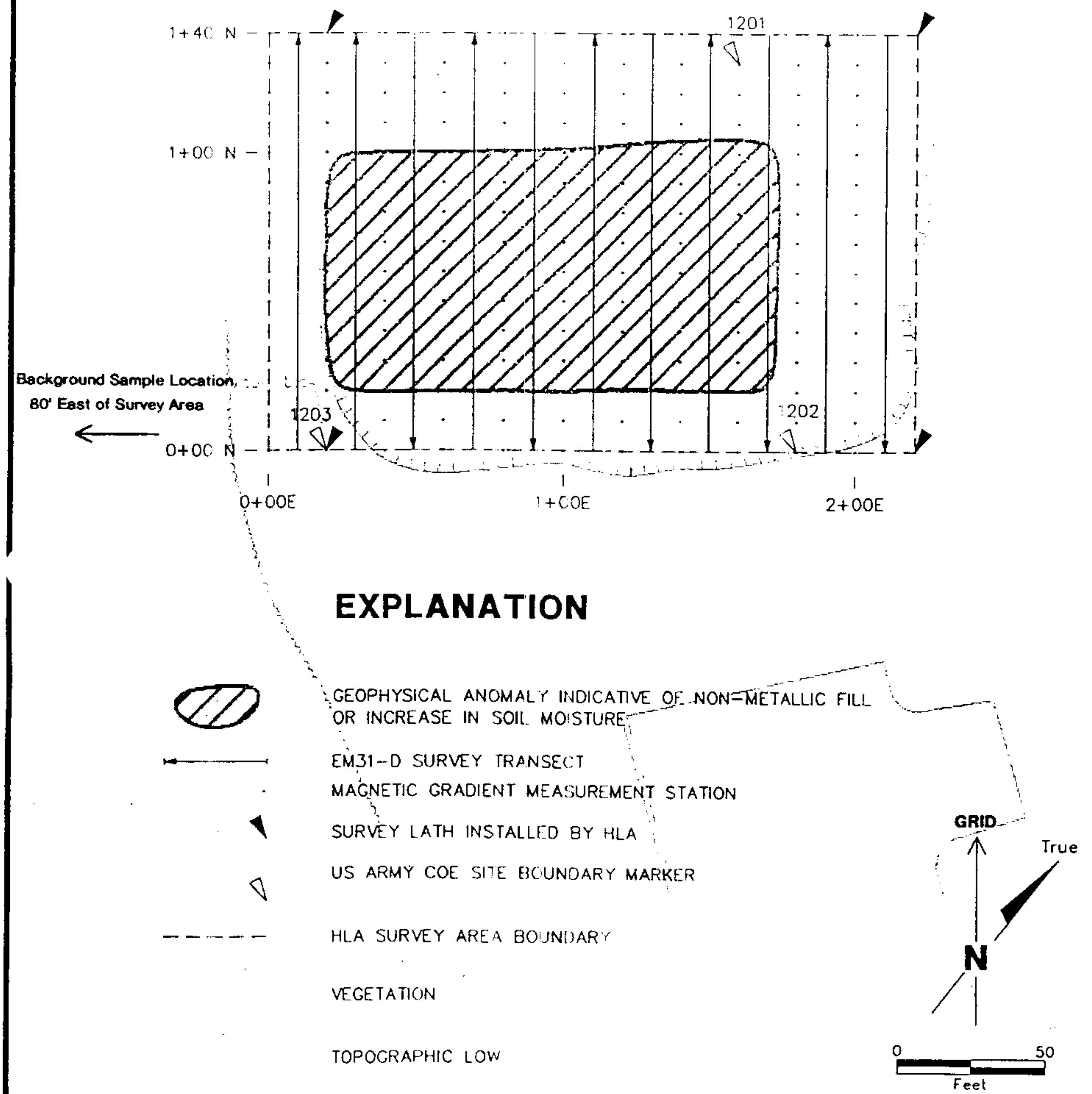
The H-83-C Site is characterized by disturbed topography consistent with the presence of demolished building foundations. Two raised areas contain evidence of sheet metal and demolition debris. A low mound approximately 80 feet northeast of the survey area also appears related to a former structure. The L-shaped survey area consisted of a main portion measuring 350 feet by 200 feet with an extension to the northeast measuring 100 feet by 160 feet (Figure 4-8). Geophysical data suggested the presence of reinforced concrete or buried debris in three areas, each coincident with a topographically raised feature. Evidence of a buried pipeline, possibly a water line, was present between two of the anomalies. The third anomaly is present outside of the gridded survey area and was delineated based on a reconnaissance survey.

4.1.6 H-83-L SITE

Geophysical survey information for a third of the H-83-L Site is available from earlier site investigations (WHC 1992). Areas covered under the earlier investigations were extended to cover adjacent, suspect areas during the current characterization. EM and MAG surveys were conducted around the entire perimeter of the previously surveyed H-83-L area on a 20-foot grid spacing interval over an area of approximately 4.8 acres. Figure 4-9 is a location map of the H-83-L Site showing the perimeter area surveyed and the new anomalies identified as a result of this survey. The geophysical anomalies identified in Figure 4-10 include those identified in both the current and previous geophysical studies (WHC 1992).

4.1.7 PSN 01 SITE

Figure 4-11 illustrates the 160 foot by 90 foot area surveyed at the PSN 01 Site. The site is relatively flat and vegetation is characterized by grasses. In general, geophysical data

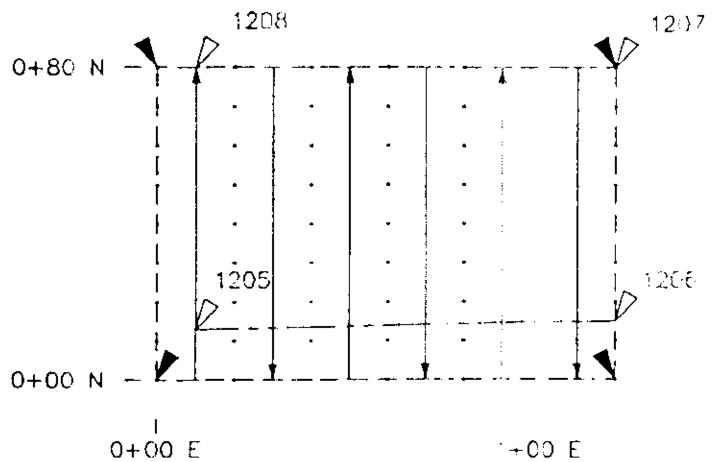


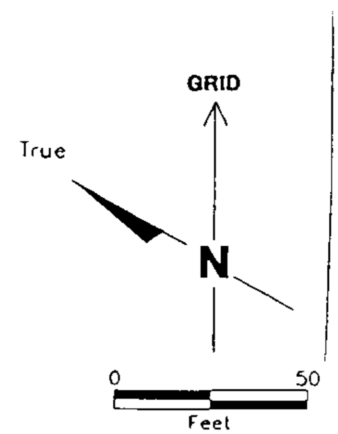
HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-12-L 1

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure No. 4-5

Geophysical Survey Coverage





EXPLANATION

EM31-D SURVEY TRANSECT

MAGNETIC GRADIENT MEASUREMENT STATION

GEOPHYSICAL DATA POINT USED FOR CONTOURING

1206

US ARMY COE SITE BOUNDARY AND MARKING LATH WITH NUMBER

HLA SURVEY AREA BOUNDARY AND MARKING LATH

NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE

HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-12-L 2

CDM FEDERAL PROGRAMS CORPORATION
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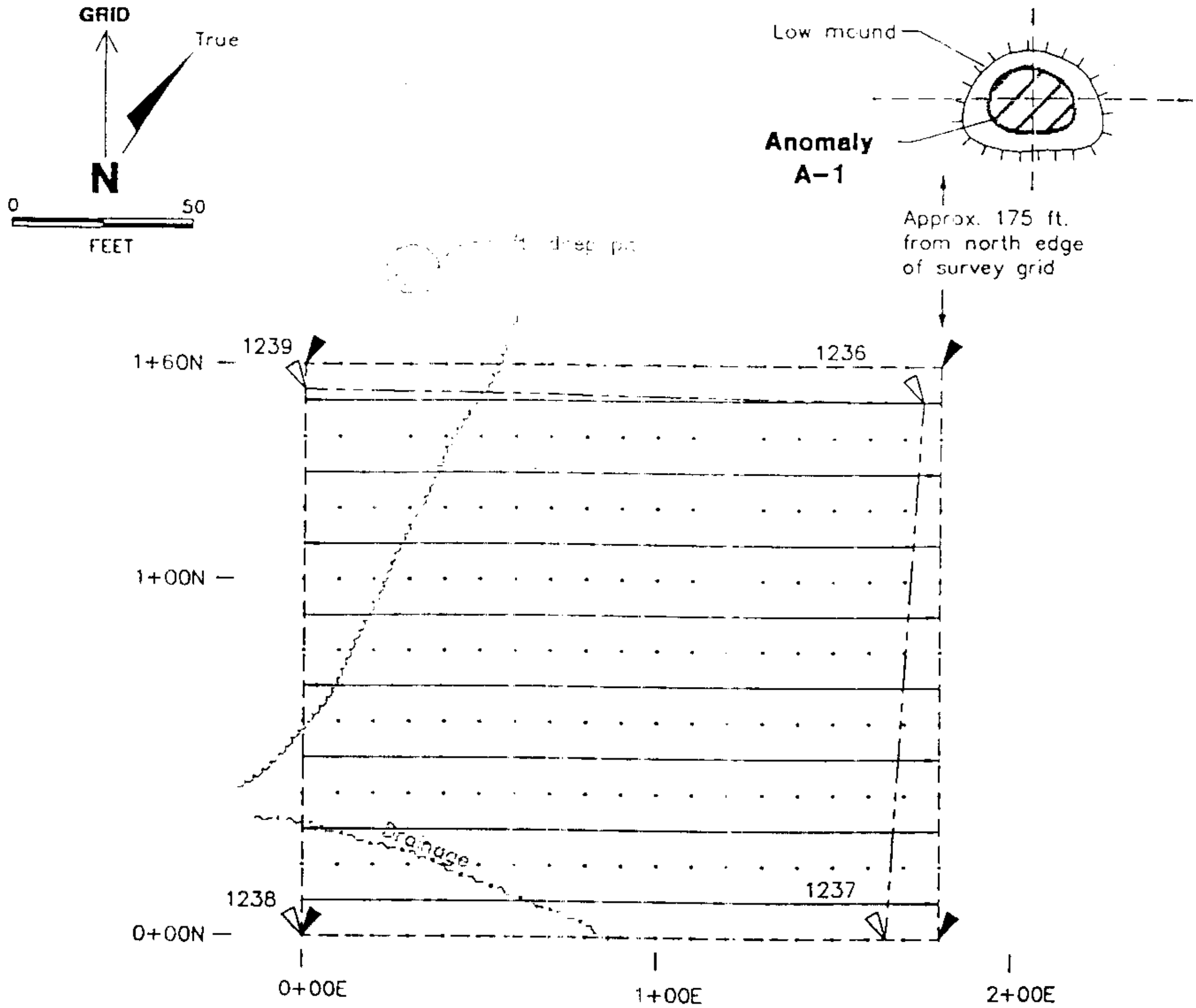
Figure No. 4-6



EXPLANATION

GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL

EM31-D SURVEY TRANSECT

RECONNAISSANCE EM31-D SURVEY TRANSECT
(approximate location)

MAGNETIC GRADIENT MEASUREMENT STATION

1253 — COE Mark Designation Number

US ARMY COE SITE BOUNDARY AND COE INSTALLED MARKING LATH

HLA SURVEY AREA BOUNDARY AND HLA INSTALLED MARKING LATH

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-81-R

Figure No. 4-7

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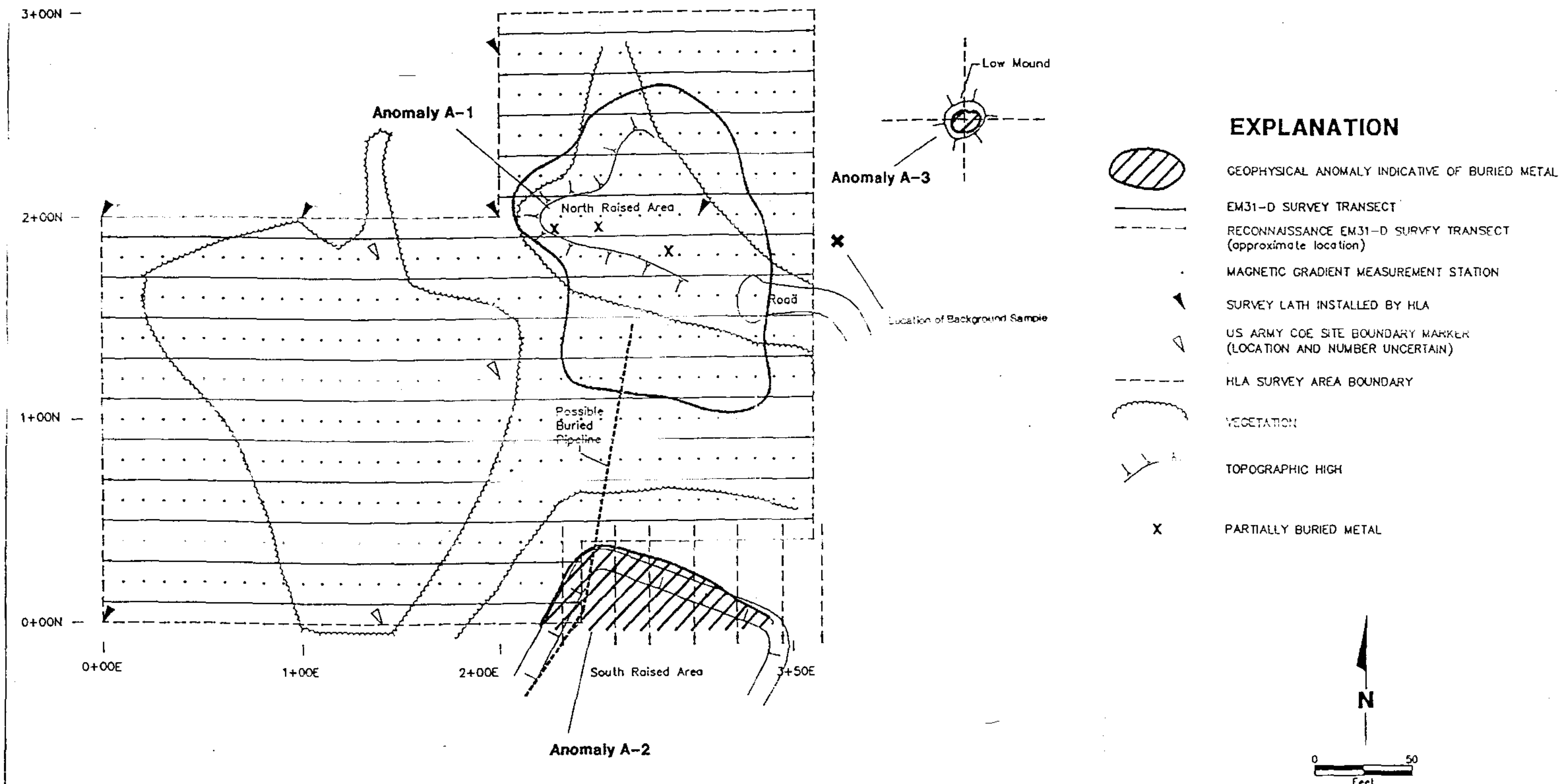

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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-83-C

Figure No. 4-8

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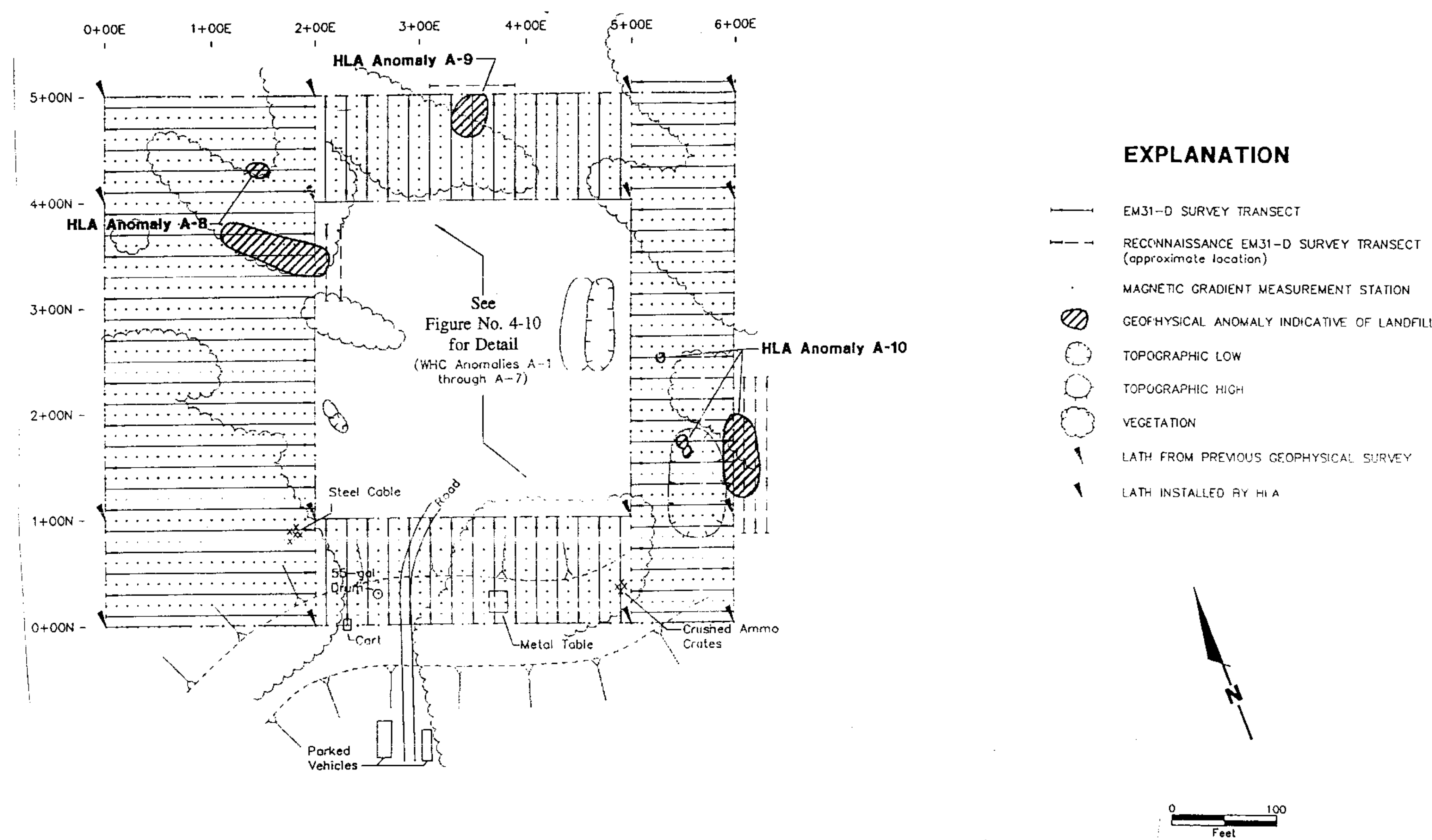

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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE H-83-L

Figure No. 4-9

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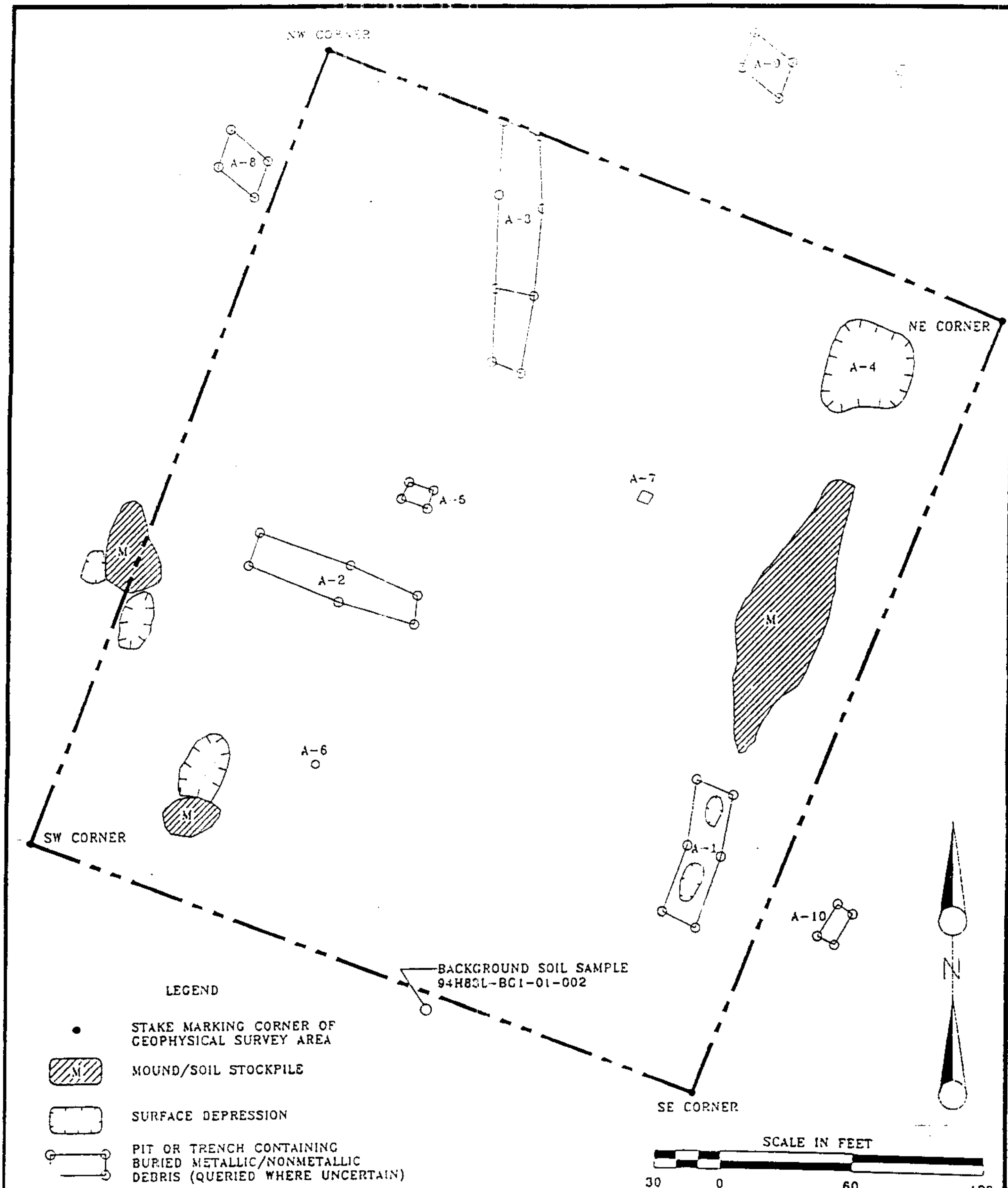

HANFORD NORTH SLOPE
SITE MAP WITH GEOPHYSICAL INTERPRETATION
LANDFILL SITE H-83-L
(WHC, 1992, HLA, 1994)

CDM FEDERAL PROGRAMS CORPORATION
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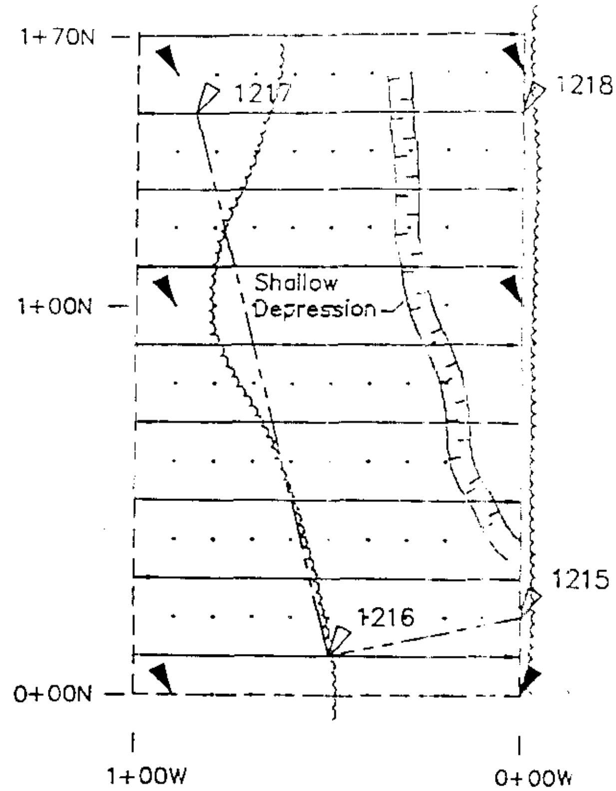
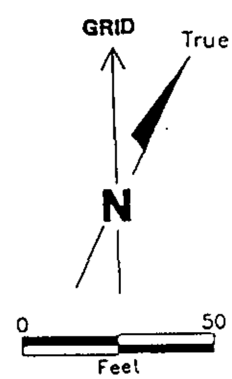
Figure No. 4-10



EXPLANATION

- EM31–D SURVEY TRANSECT
- RECONNAISSANCE EM31–D SURVEY TRANSECT
- MAGNETIC GRADIENT MEASUREMENT STATION
- DATA POINT USED FOR CONTOURING
- US ARMY COE SITE BOUNDARY
- HLA SURVEY AREA BOUNDARY
- SURVEY LATH INSTALLED BY HLA
- 1218 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER
- VEGETATION



NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE

HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE PSN 01

CDM FEDERAL PROGRAMS CORPORATION
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Figure No. 4-11

collected did not suggest any areas of buried wastes. Isolated, low-magnitude MAG responses were interpreted to represent minor small metallic objects and not landfill materials. No further investigation was conducted at this site.

4.1.8 PSN 04 SITE

The six anomalies previously identified at the PSN 04 Site (WHC 1992) were confirmed by HLA during the current characterization. Figure 4-12 is a location map of the PSN 04 Site showing the perimeter area surveyed and the six anomalies identified during the previous investigation. The verification survey generally confirmed the locations and dimensions of the anomalies as previously determined No new areas were surveyed during the current investigation.

4.1.9 PSN 12/14 SITE

Geophysical surveys of the PSN 12/14 Landfill Site covered an area of about 600 feet by 1,200 feet (Figure 4-13). EM and MAG surveys were conducted on suspect areas delineated by USACE. Fourteen distinct geophysical anomalies, indicative of buried debris, were identified. Most of the anomalies were characterized by a large, high amplitude EM instrument response suggesting buried metal and other conductive materials. At least one anomaly (A-2) yielded little or no MAG response suggesting variations in soil type or conductivity.

4.1.10 PSN 72/82 SITE

A relatively flat site, PSN 72/82 is a grassy clearing among sagebrush. An area of 150 feet by 200 feet was surveyed using EM and MAG instruments (Figure 4-14). Small amounts of barbed wire and other debris were present at the surface. These areas of minor surface debris caused minimal variations in geophysical instrument response. No evidence of buried materials was detected. No additional investigations were conducted at the PSN 72/82 Site.

4.1.11 PSN 90 SITE

Figure 4-15 is a map of the geophysical survey grid and the geophysical anomalies identified within the PSN 90 Site measuring 450 feet by 280 feet. The site is characterized by grasses and sagebrush, disturbed topography and abundant surface debris. Several large pieces of sheet metal were associated with mounds of soil and rubble in portions of the site. Three high-amplitude geophysical anomalies in the northern portion of the site were associated with these mounds and surface debris. A fourth anomaly, indicative of small amounts of shallowly buried metal was not identified in the field and was therefore not subject to subsequent excavation and trenching. This anomaly was noted during data reduction in the office. Geophysical information for a fifth anomaly, A-5, is consistent with a buried pipe, possibly a waterline from a nearby wellhouse.

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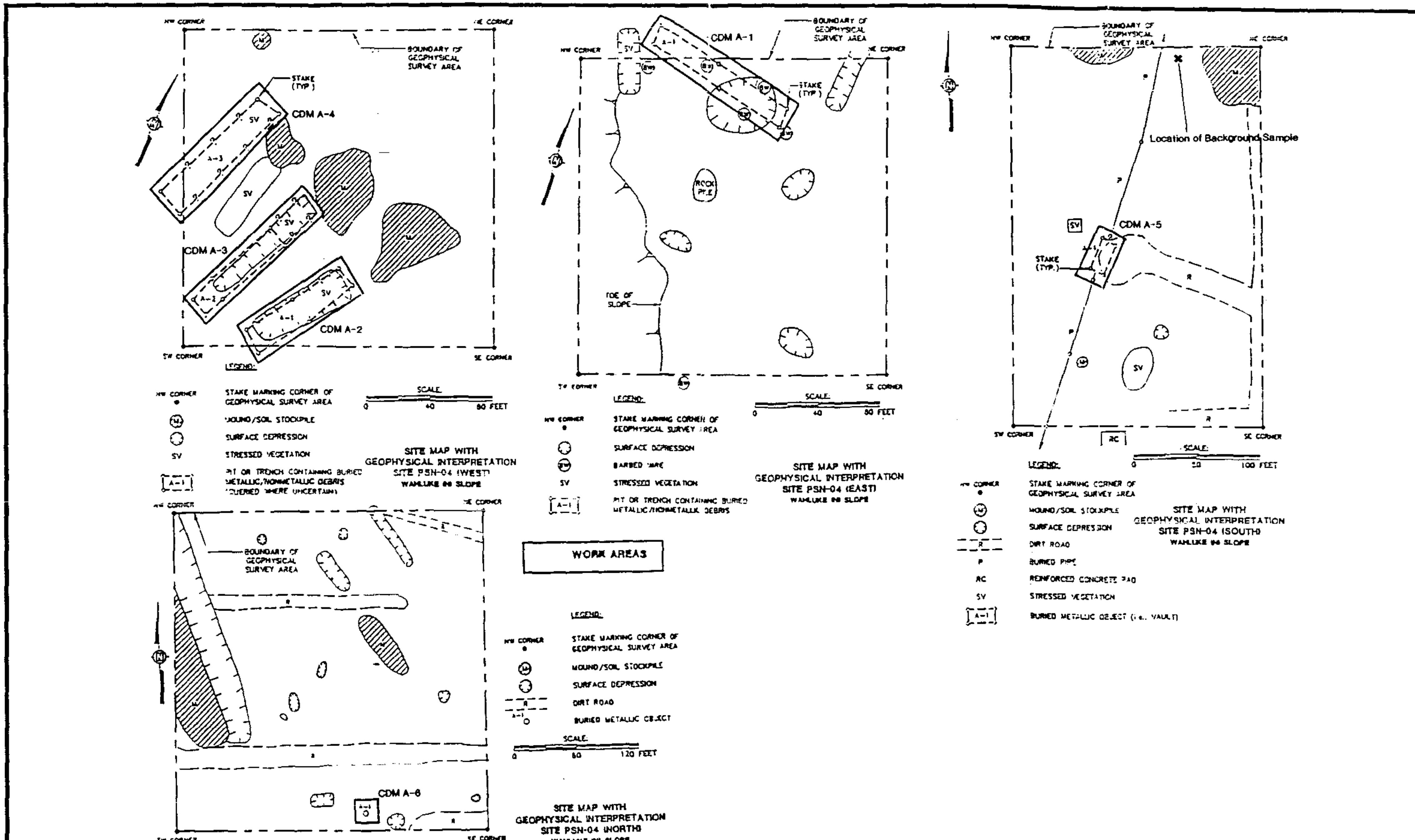

HANFORD NORTH SLOPE
USACE GEOPHYSICAL SURVEY COVERAGE
SITE PSN 04

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure No. 4-12

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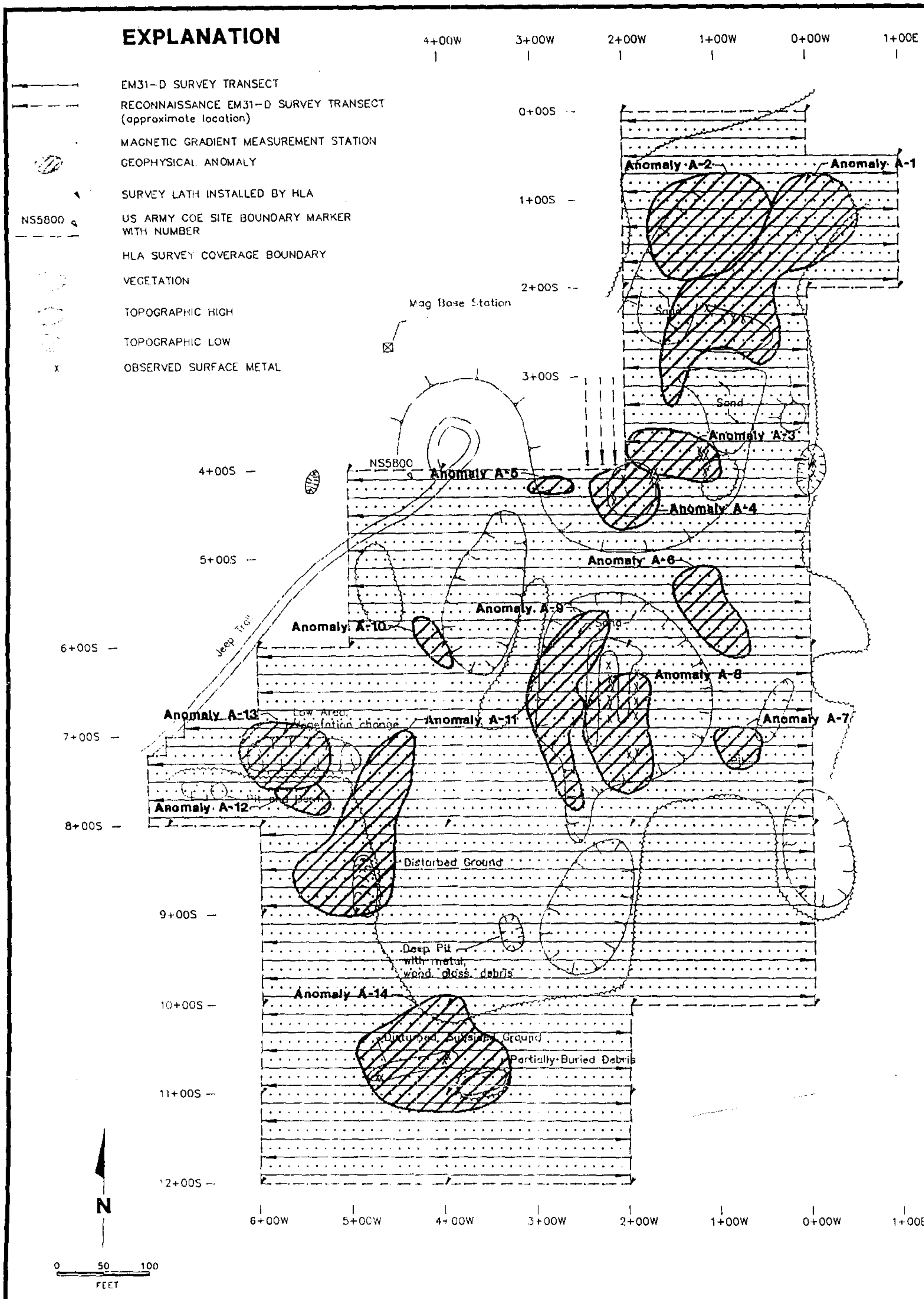

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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE PSN 12/14

Figure No. 4-13

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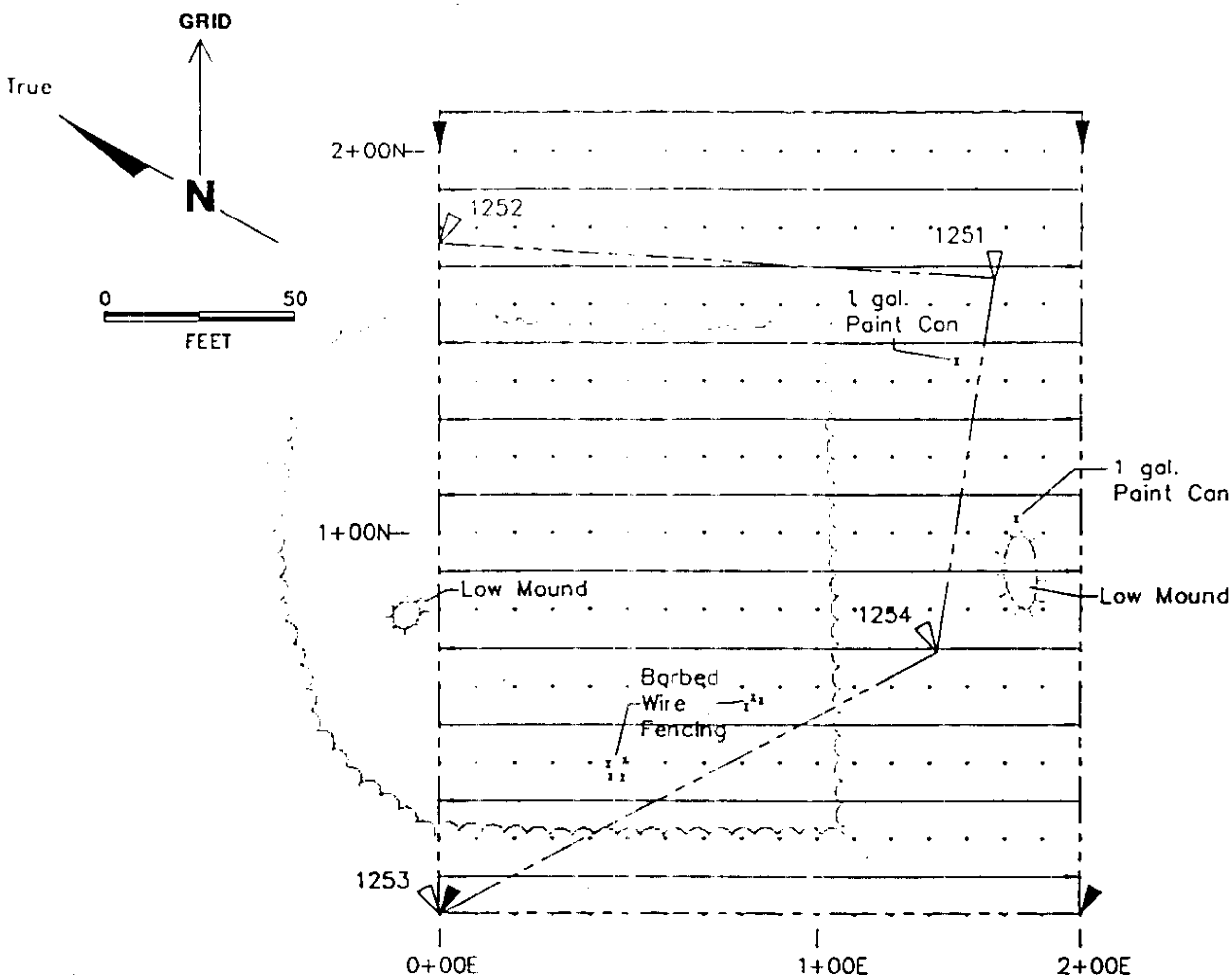

EXPLANATION

EM31-D SURVEY TRANSECT

MAGNETIC GRADIENT MEASUREMENT STATION

1253 COE Mark Designation Number

US ARMY COE SITE BOUNDARY AND
COE INSTALLED MARKING LATH

HLA SURVEY AREA BOUNDARY AND
HLA INSTALLED MARKING LATH

VEGETATION

HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE PSN 72/82

CDM FEDERAL PROGRAMS CORPORATION
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Figure No. 4-14

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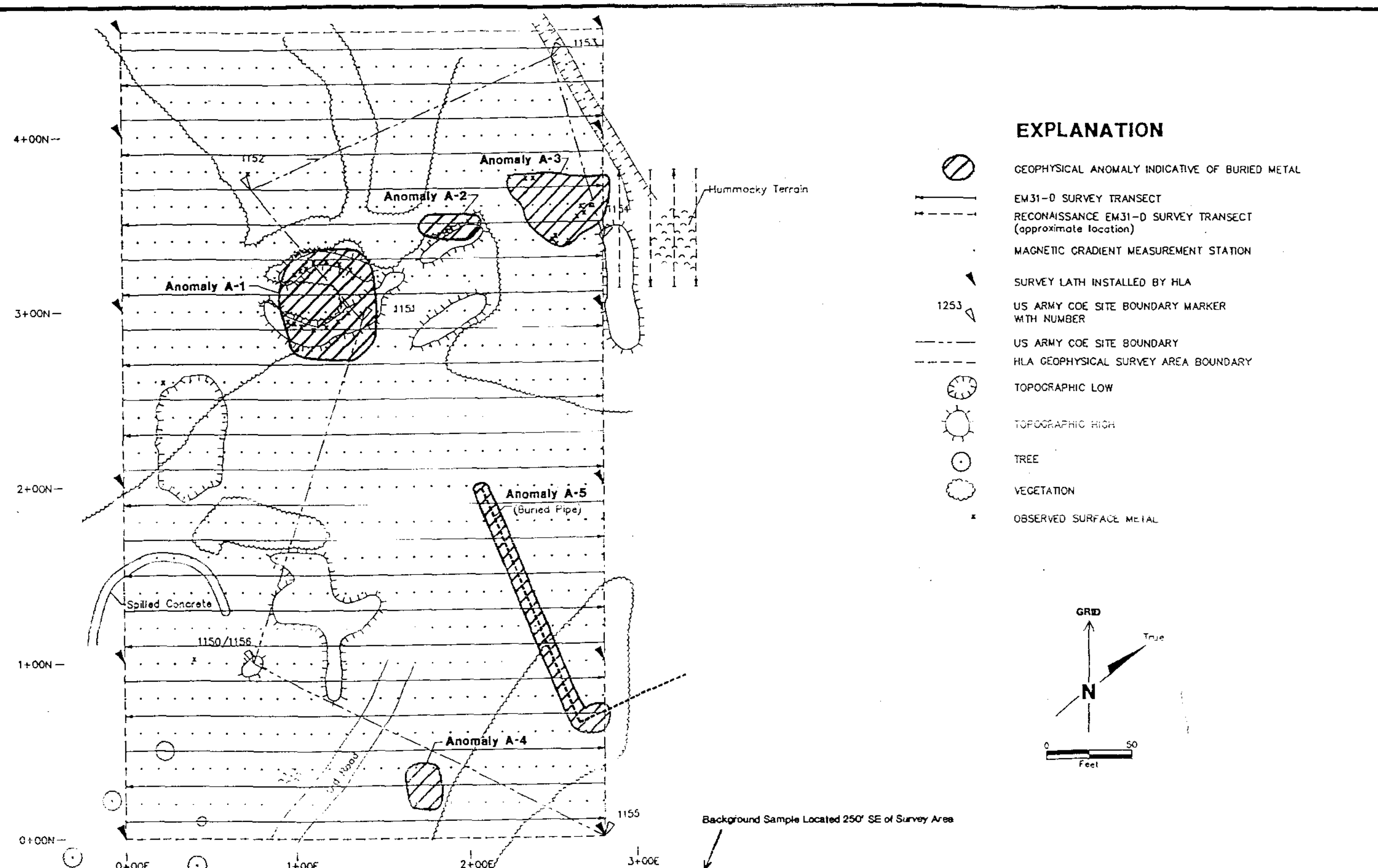

CDM FEDERAL PROGRAMS CORPORATION
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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE PSN 90

Figure No. 4-15

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4.1.12 BRIDGE OVERLOOK SITES

The Bridge Overlook Sites consists of two separate areas, each characterized by sandy soils and gently sloping terrain. Both sites were littered with old lumber and lesser amounts of glass and metallic debris. The Bridge Overlook 1 Site survey was conducted within an area of 200 feet by 100 feet (Figure 4-16). An area of 200 feet by 300 feet was surveyed for the Bridge Overlook 2 Site (Figure 4-17). Four areas of anomalous geophysical response, indicative of buried materials were identified at the Bridge Overlook 2 Site. No anomalies were detected within the Bridge Overlook 1 survey area.

4.1.13 IGLOO SITES

Figure 4-18 is a site map of the geophysical survey grid depicting the single geophysical anomaly identified within an area of 160 feet by 120 feet at Igloo 1. Figure 4-19 is a map of the geophysical survey grid and the single geophysical anomaly identified within an area of 310 feet by 160 feet at Igloo 2. Each site contained a large raised area which was sparsely vegetated. A single large and well-defined area of geophysical response was coincident with each of these mounded areas. The strong instrument response suggested metal was present within 5 feet of the surface of the ground.

4.2 TRENCHING/EXCAVATION RESULTS

Areas of anomalous geophysical response at each North Slope site were excavated to evaluate buried wastes. At least one trench was excavated through each anomaly unless noted below. The locations of each anomaly, as well as the locations of background samples and stressed vegetation soil samples, are depicted in Figures 4-1 through 4-19. Table 4-1 presents a summary of the trenching activities including: excavation completion dates, approximate trench dimensions, approximate volume of material excavated, number of soil samples sent offsite for analysis and a waste inventory for each anomaly excavated. All potentially hazardous materials were segregated and placed on Port-a-Pads or on minimum 6-mil visqueen sheets. Smaller quantities of potentially hazardous materials stockpiled on the Port-a-Pads were later transferred to DOT-approved 55-gal. drums. A waste inventory is included in Appendix E.

Three trenches were excavated in Anomaly A-1 at Site H-83-C. Two other anomalies at Site H-83-C appeared to coincide with reinforced concrete present in former building foundations and, at the direction of the USACE, were not excavated.

During the field work at PSN 04, the geophysical anomalies previously identified (WHC 1992) were redesignated. Previously designated Anomalies A-1, A-2, and A-3 in PSN 04 West were redesignated as A-2, A-3, and A-4. Previously designated Anomaly A-1 in PSN 04 South was redesignated as A-5, and A-1 in PSN 04 North was redesignated as A-6.

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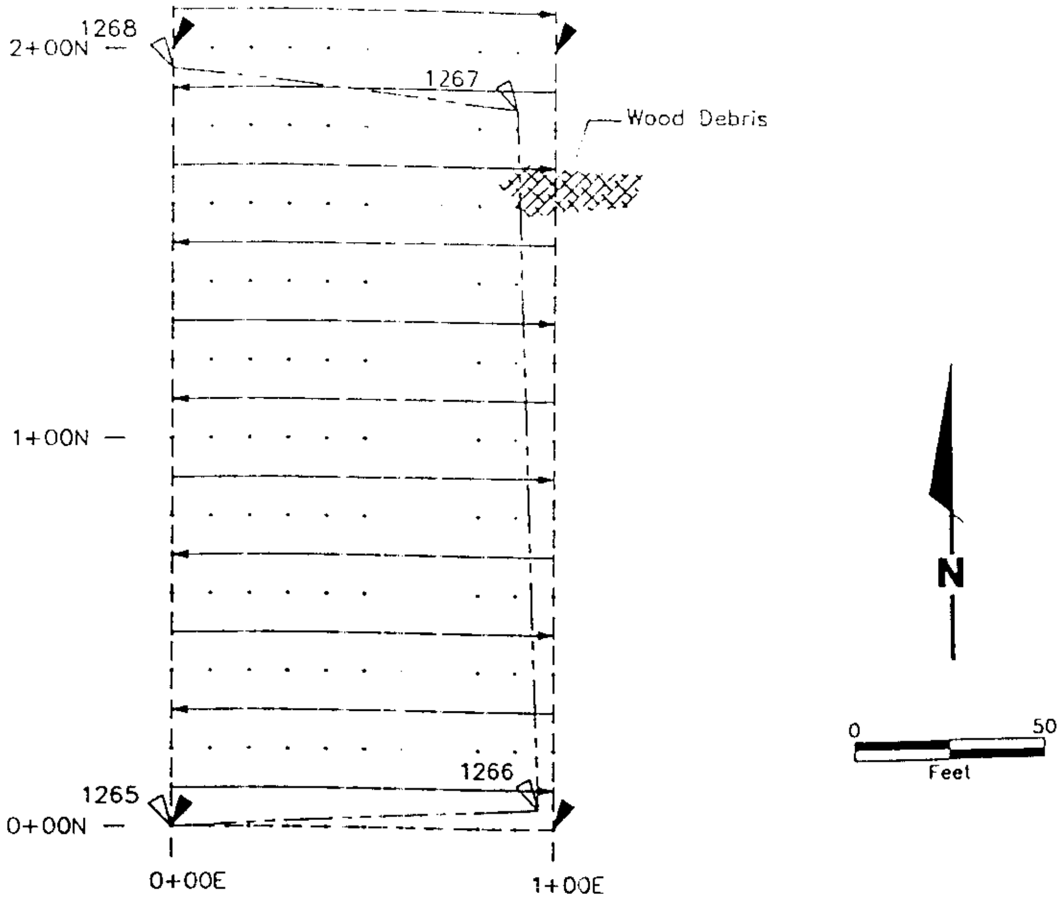
Geophysical Survey Coverage



EXPLANATION

- EM31–D SURVEY TRANSECT
- MAGNETIC GRADIENT MEASUREMENT STATION
- DATA POINT USED FOR CONTOURING
- SURVEY LATH INSTALLED BY HLA
- 1265 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER
- US ARMY COE SITE BOUNDARY
- HLA SURVEY AREA BOUNDARY

NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE

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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
BRIDGE OVERLOOK 1

Figure No. 4–16

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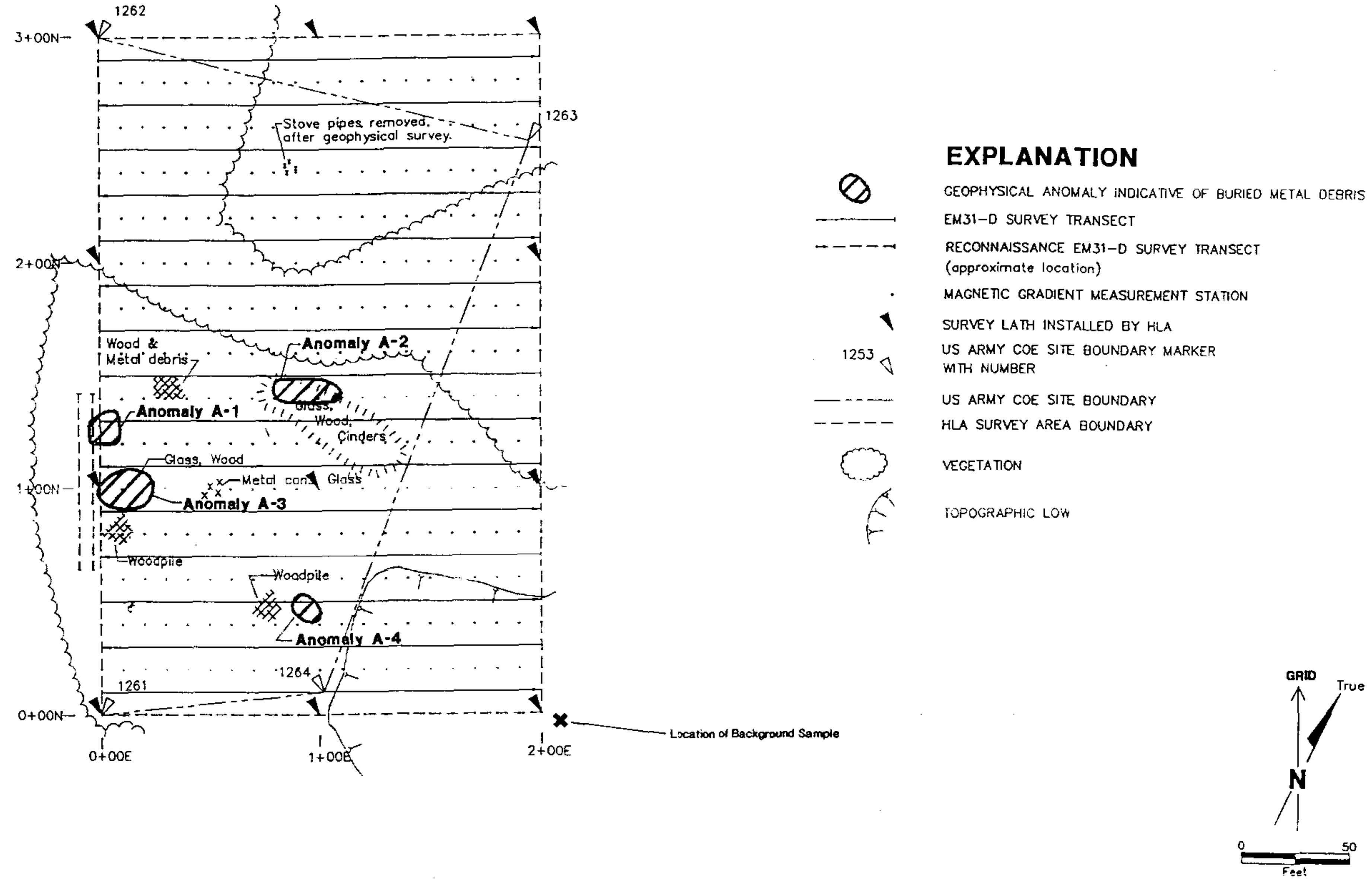
9513596.2487



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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
BRIDGE OVERLOOK 2

Figure No. 4-17

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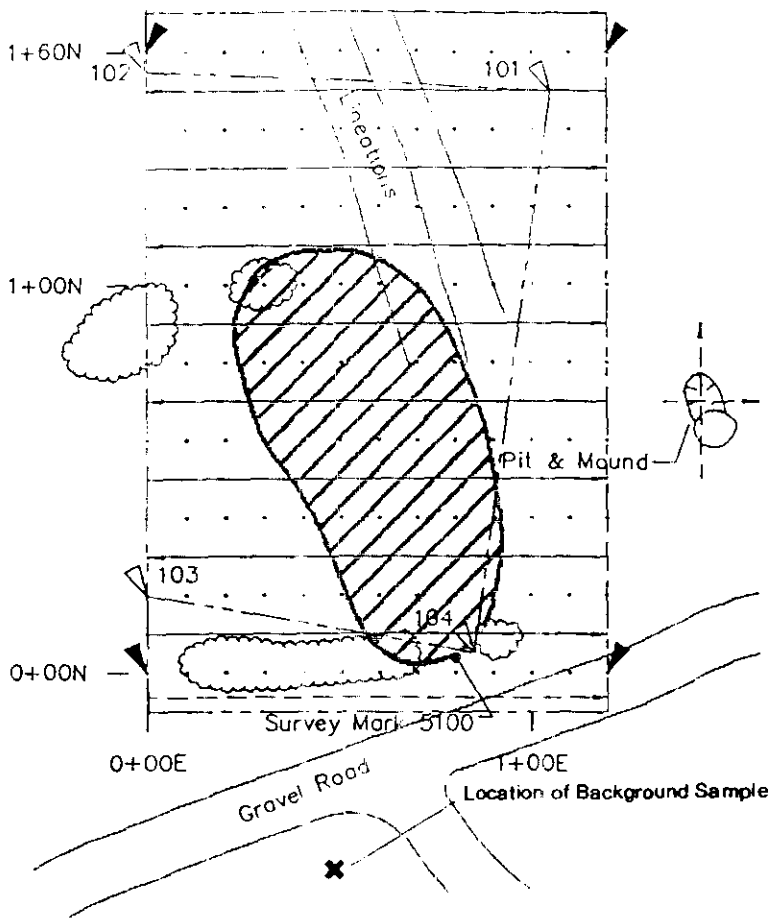
Geophysical Survey Coverage
and Anomaly Map



EXPLANATION

GEOPHYSICAL ANOMALY INDICATIVE OF LANDFILL

EM31-D SURVEY TRANSECT

RECONNAISSANCE EM31-D SURVEY TRANSECT
(approximate location)

MAGNETIC GRADIENT MEASUREMENT STATION

DATA POINT USED FOR CONTOURING

US ARMY COE SITE BOUNDARY

HLA SURVEY AREA BOUNDARY

SURVEY LATH INSTALLED BY HLA

104 US ARMY COE SITE BOUNDARY MARKER
WITH NUMBER

VEGETATION

GRID

N

0 50
Feet

HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE IGLOO 1

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Figure No. 4-18

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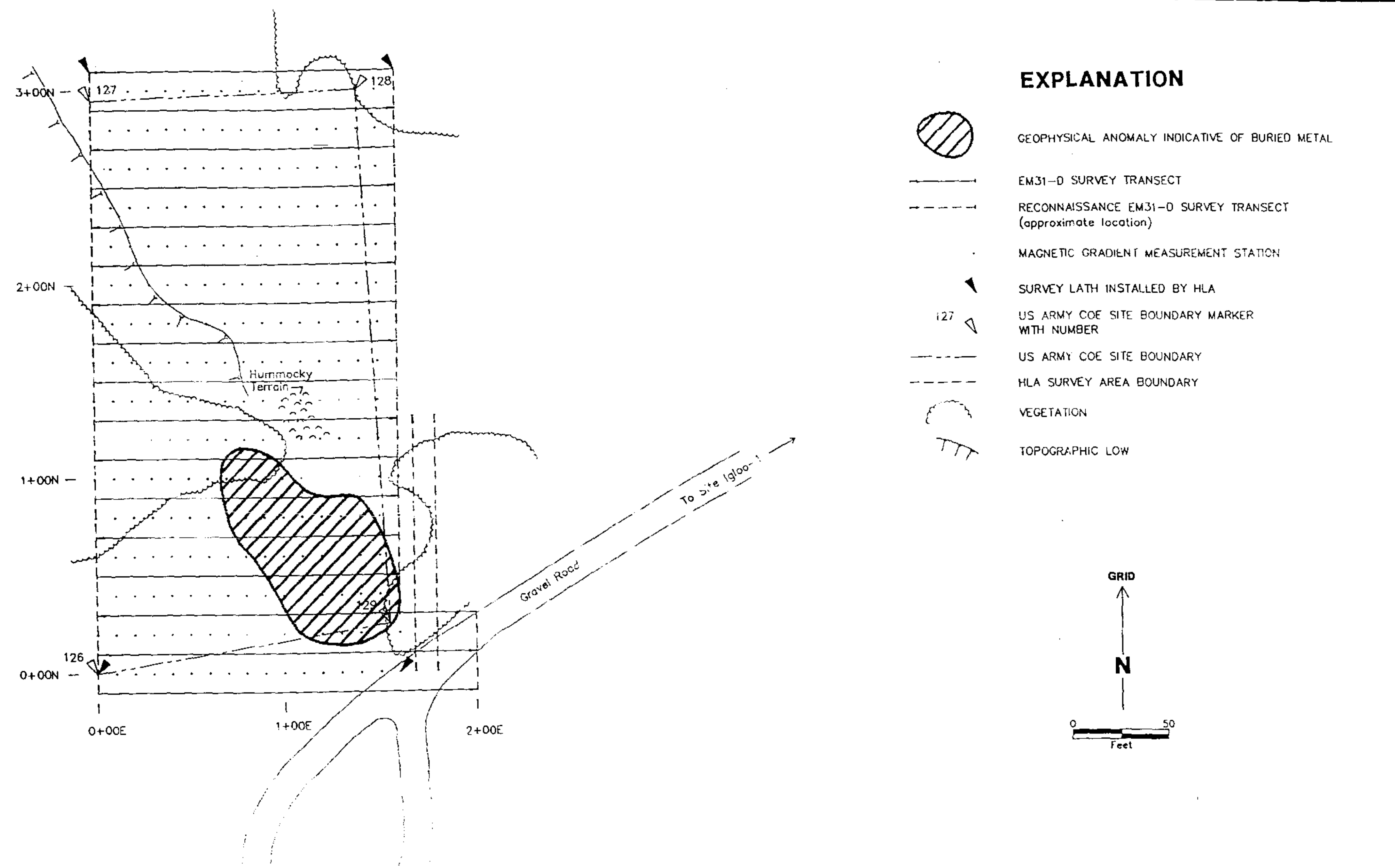

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HANFORD NORTH SLOPE
HLA GEOPHYSICAL SURVEY COVERAGE
SITE IGLOO 2

Figure No. 4-19

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TABLE 4-1

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
H-06-L West/ A-1	4/26/94	30 x 12 x 3	40	0	Construction debris: corrugated steel, gypsum wall board, tar, paper, wire, wood
H-06-L West/ A-2	4/26/94	70 x 12 x 3	93	0	Bottles, 1 oil filter, lumber, rags, light bulbs, several rusted 5-gal. cans (one w/ residual oil)
H-06-L West/ A-3	4/26/94	3 x 3 x 3	1	0	One coil of insulated wire
H-06-L West/ A-4	5/04/94	60 x 15 x 18	600	4	Glass, wire, zinc-carbon batteries, lumber, 1 engine block, 1 5-gal. cans dried paint (lead based), burned trash, 1 5-gal. gas can (empty) (PID = 60 ppm), stained soil (PID = 20-50 ppm)
H-06-L West/ A-5	4/25/94	180 x 15 x 8	800	3	Lumber, scrap iron, aluminum, cable, pipe, concrete rubble, tent, telephone pole, car frame, 2 55-gal. drums (PID = 60 ppm), 1 55-gal. drum roofing tar (PID = 10 ppm), 1 5-gal. can oil
H-06-L West/ A-6	4/25/94	180 x 15 x 8	800	0	Rusted sheet metal, 1 55-gal. drum empty, transite, note; Anomaly A-6 was excavated concurrently with the A-5 Anomaly
H-06-L West/ A-7	4/23/94	100 x 15 x 4	222	2	Aluminum sheet, car hood, pipe, 6 empty 1-gal. cans insecticide (labeled DDT, Chlordane, kerosene, PID =3.8 ppm), 3 5-gal. cans lube oil, empty burned cans, bottles, wood, transite tile, scrap wire, 1 5-gal. can with residual dried paint (PID = 14 ppm)
H-06-L West/ A-8	4/23/94	5 x 5 x 1	1	0	One roll of barbed wire
H-06-L West/ A-9	4/22/94	3 x 3 x 4	1	0	No metallic debris or evidence of disturbed soil
H-06-L West/ A-10	4/23/94	4 x 6 x 3	3	0	Steel reinforcing mesh, burned lumber
H-06-L West/ A-11	4/23/94	5 x 5 x 3	3	0	Scrap metal: wire, rebar, angle iron
H-06-L West/ A-12	4/26/94	62 x 10 x 7	161	0	Wire spool, burned lumber, bottles, wire, empty paint cans, gypsum board, steel
H-06-L West/ A-13	4/26/94	30 x 10 x 4	44	0	Trash: bottles, cans, copper wire, paper, shoes, rags, 1 5-gal. oil can (empty), 1 5-gal. can ethylene glycol, 3 5-gal. cans (all empty) hydraulic oil
H-06-L West/ A-14	4/22/94	10 x 4 x 3 5 x 4 x 2	4 2	0 0	Two pieces of sheet metal, wire, 2 5-gal pails (crushed) note: A-14 contained 2 anomalies
H-06-L West/ A-15	4/22/94	12 x 20 x 5	44	0	Copper wire, pipe, food cans, lumber, paper, 2 5-gal. cans (flattened and rusted)
H-06-L West/ A-16	4/22/94	75 x 12 x 3 25 x 12 x 3	100 33	2 0	Building debris; concrete, fencing, cable, wire mesh, bottles and cans (beverages), scrap cable one 55-gal. drum empty (PID = 12 ppm), 1 5-gal. can lube oil empty, note: A-16 consisted of 2 anomalies

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
H-06-L West/ A-17	4/21/94	12 x 12 x 5 4 x 6 x 3 8 x 8 x 5	27 3 12	1 0 0	Trash; burned paper and wood, bottles, cans, scrap cable, 1 5-gal can rusted oily contents, several crushed 5 gal empty buckets, note: A 17 contained 3 anomalies
H-06-L West/ A-18	NA	NA	NA	0	Anomaly A-18 could not be located
H-06-L West/ A-19	4/21/94	200 x 10 x 9	667	3	Copper wire, burned lumber/ paper, batteries, oily rags/ stained soil (PID = 2 ppm) 2 empty 5-gal. drums, soda/ bleach bottles, 1 55-gal drum (empty)
H-06-L West/ A-20	4/19/94	6 x 10 x 6	13	2	Lumber, wheel rim, collasped oil drum, trash; glass, bottles (cologne, beverages) burned paper, potential asbestos, 1-gal. can with residual dried paint, construction debris
H-06-L West/ A-21	4/19/94	6 x 3 x 3	2	0	Burned paper, glass, trash, scrap wire, steel plate
H-06-L West/ A-22	4/19/94	3 x 3 x 2	1	0	One roll of rusted barbed wire
H-06-L West/ A-23	4/26/94	30 x 10 x 4	44	0	Burned paper, wood, bottles, stainless steel, 1 55-gal. drum (rusted and crushed) filled with burned trash, note. Anomaly A-23 was excavated concurrently with the A 13 Anomaly (HLA-1)
H-06-L West/ A-24	4/26/94	60 x 12 x 3	80	0	Glass, burned lumber, pipes, wire, empty paint cans (HLA-2)
H-06-L West/ A-25	4/26/94	54 x 15 x 9	270	0	Beverage bottles, lumber, scrap metal , insulated wire, auto bumper, angle iron, crushed deteriorated drums (HLA-3)
H-06-L East/ A-1	5/13/94	65 x 15 x 14	505	10	Construction debris; lumber, sheet metal, plywood, barbed wire, 6-cylinder engine block, stained soil (PID = 8 ppm), approximately 600 cy of DDT-contaminated soils (PID = 6-8 ppm).
H-06-L East/ A-2	5/02/94	45 x 12 x 6	120	0	Concrete blocks, glass, paper, cans, minor sheet metal, metal cork screw anchors.
H-06-L East/ A-3	4/28/94	28 x 22 x 4	91	0	Transite siding, 1 oil filter, concrete debris.
H-06-L East/ A-4	4/28/94	10 x 10 x 4	15	0	Two car engine blocks, 1 55-gal. drum, burned trash, bottles.
H-06-L East/ A-5	4/27/94	20 x 12 x 7	62	0	Bottles, cans, lumber, 1 55-gal. drum (rusted), scrap metal.
H-06-L East/ A-6	5/03/94	65 x 15 x 13	470	0	Car engine block and body, fiberglass insulated pipe, barbed wire.
H-06-L East/ A-7	4/28/94	90 x 18 x 12	720	0	Ten concrete pole anchors w/ poles, 2 55-gal. drums (crushed), some lumber, burned waste; lumber, glass, pipes, wire, newspaper.

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
H-06-L East/ A-8	4/28/94	80 x 15 x 10	445	0	Angle iron, glass bottles, sheet metal, 1 55-gal. drum (rusted and flattened), 1 gal. can hydraulic fluid (empty), paper trash.
H-06-L East/ A-9	4/28/94	80 x 15 x 10	445	0	One 5-gal. bucket containing black oily sludge, burned paper, glass, transite, pipe and siding, burlap sacks, wire, 1 5-gal. grease can, note: Anomaly A-9 was excavated concurrently with the A-8 Anomaly.
H-06-L East/ A-10	4/28/94	90 x 18 x 12	720	0	Food trays, silverware, steel pipe and angle iron, 5 55-gal. drums (crushed), wire spools, glass, burn drum, note: Anomaly A-10 was excavated concurrently with the A-7 Anomaly.
H-06-L East/ A-11	4/29/94	220 x 15 x 12	1467	1	Car chassis and engine, 2 5-gal. cans (empty), concrete debris, 1 5-gal. can w/ black tar sub., burned wastes; bottles, lumber, paper, cans, wire, scrap metal, 10 galvanized trash cans, several 55-gal. drums (crushed), 1 toilet bowl.
H-06-L East/ A-12	4/27/94	50 x 22 x 12	489	2	Several galvanized trash cans, beverage bottles, scrap metal, several 1-gal. antifreeze cans (empty), pipes, burned lumber, canvas tarp, 1 55-gal. drum (crushed/ rusted) w/ residual black oily material.
H-06-L East/ A-13	NA	NA	NA	0	Anomaly A-13 could not be located.
H-06-L East/ A-14	4/27/94	12 x 12 x 1	5	1	Empty paint cans (1-quart, 1-gal.), 1-gal can insecticide (empty) (PID = 9.8 ppm), 2 5-gal. cans containing residual black tar substance.
H-06-L East/ A-15	NA	NA	NA	0	Anomaly A-15 was not located during field reconnaissance.
H-06-L East/ A-16	4/27/94	6 x 5 x 1	1	0	Steel Sign (2ft x 3ft), (HLA-4).
H-06-L East/ A-17	4/29/94	220 x 15 x 12	1467	0	(HLA-5) Anomaly A-17 was excavated concurrently with the A-11 Anomaly.
H-06-L East/ A-18	4/28/94	22 x 14 x 14	160	0	No evidence of any buried wastes or disturbed soil (HLA-6).
H-06-L East/ A-19	4/28/94	50 x 6 x 7	78	0	Boiler tank, scrap metal; pipes and sheet metal, burned lumber, several 5-gal. drums (crushed) car chassis and engine, (HLA-7).
H-12-C	NA	NA	NA	0	Geophysical investigations yielded no evidence of buried wastes at the site. No excavation work was conducted.
H-12-L	NA	NA	NA	0	Geophysical investigations yielded no evidence of buried wastes at the site. No excavation work was conducted.

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
H-81-R/A-1	7/12/94	10 x 10 x 2	7	0	Anomaly was detected within a low mound. Upon excavation, foundation was encountered. No material was removed.
H-83-C/A-1	7/15/94	30 x 4 x 1.5 100 x 4 x 2 55 x 4 x 2	7 30 12	0	Building demolition debris and a 12' wide concrete slab were encountered. No material was removed.
H-83-C/A-2	NA	NA	NA	0	Geophysical investigations suggested anomalies coincident with reinforced concrete in building foundations. No excavation work was conducted.
H-83-C/A-3	NA	NA	NA	0	Geophysical investigations suggested anomalies concident with reinforced concrete in building foundations. No excavation work was conducted
H-83-L/A-1	6/16/94	50 x 15 x 12	333	0	Burn pit; paper, bottles, wood scrap, rusted food cans, 3 55-gal. drums (empty, PID=0.0 ppm), miscellaneous metal pipes, 1 battery (carbon zinc), 1 empty 5-gal. can (diesel).
H-83-L/A-2	6/15/94	65 x 8 x 8	154	0	Spent missile component (booster engine), scrap metal, miscellaneous wood timbers, concrete rubble, screen mesh, 1 5 gal. can (empty, PID=0.0 ppm), washing machine agitator.
H-83-L/A-3	6/16/94	90 x 12 x 12	480	1	Burn debris, sheet metal, 5 55-gal. drums (empty, PID=0.0 ppm), bottles, swamp cooler, wire, 1 trash can, 1 gas mask filter, 1 rusted stove, 1 telephone pole.
H-83-L/A-4	6/16/94	25 x 25 x 8	185	0	Five spools of wire, metal lid, 10-15 partially burned burlap sacks (PID=0.0 ppm), burned scrap wood, sheets of plastic (visqueen), misc. scrap wood, 1 shell casing 30-00 (empty).
H-83-L/A-5	6/15/94	4 x 5 x 2	1.5	0	Steel cable.
H-83-L/A-6	6/15/94	4 x 5 x 2	1.5	3	Surface debris; 7 telephone poles/scrap timber, 64 1-qt. cans of PL-MED Lubricating Oil (most full, not leaking).
H-83-L/A-7	6/15/94	0	0	0	Surface debris; 1 trash can lid, no geophysical evidence of buried metal.
H-83-L/A-8	6/17/94	25 x 5 x 4	19	0	1 55-gal. drum (empty, PID=0.0 ppm), scrap sheet metal, plastic visqueen, concrete rubble, and scrap wood (construction debris).
H-83-L/A-9	6/20/94	40 x 15 x 10	222	0	1 metal grate, lots of metal debris, 1 5-gal. can filled with sand (PID=0.0 ppm), miscellaneous construction debris, wall board, metal plumbing, bottles and cans, 1 5-gal. bucket (empty).

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
H-83-L/A-10	6/20/94	20 x 8 x 5 5 x 5 x 4 10 x 20 x 5	30 4 37	0	Scrap metal debris, burn material, lumber, wire, rusted pipe (PID=0.0 ppm), bottles burn pit debris (PID=0.0 ppm).
PSN 01	NA	NA	NA	0	Geophysical investigations yielded no evidence of buried wastes at the site. No excavation work was conducted.
PSN 04(E)/ A-1	8/9/94	125 x 5 x 9	177	1[3]	Barbed wire, cork screw metal wire posts, misc. wire, metal beams, 55-gal drum (PID=75.0 ppm inside drum).
PSN 04(N)/ A 6	8/10/94	14 x 5 x 2	5	1[3]	8"OD 2 ft long metal pipe (PID=0.0 ppm).
PSN 04(S)/ A-5	8/10/94	22 x 6 x 6	29	1[3]	Demolition debris, concrete rubble, square metal rebar, a few rusted pipes (PID=0.0 ppm).
PSN 04(W)/ A-2	8/9/94	50 x 7 x 6	78	1[3]	Abundant transite, a few carbonized batteries, glass bottles, rusted metal (PID=0.0 ppm).
PSN 04(W)/ A-3	8/9/94	112 x 5 x 5	104	1[3]	Bricks, burned wood, misc. metal debris (PID=0.0 ppm).
PSN04(W)/ A-4	8/9/94	80 x 5 x 4 10 x 5 x 3 55 x 5 x 2.5 52 x 10 x 5	59 5.5 25 96	1[3]	Bottles, rusted trash/debris, wire, burn debris, large sheet metal debris (PID=0.0 ppm).
PSN 12/14 A-1	7/14/94	210 x 10 x 6	470	0	Glass bottles, rusted tin cans, misc. 2-in. diameter pipes, misc. trash, 12 5-gal. cans of lubrication oil (residual oil), wire and anchors, 1 5-gal. can with dried tar like substance, 1 1-gal. can hydraulic oil (empty), sheet metal, 1 hot-water heater, copper wire, many beverage bottles, burned lumber, coffee cans, gypsum board, boots, screen, electic insullators, 1 1-gal. empty paint can.
PSN 12/14 A-2	7/15/94	12 x 4 x 2 12 x 4 x 2 14 x 3 x 4 12 x 2 x 4 14 x 2 x 4 15 x 2 x 4 14 x 2 x 4	4 4 6 4 4 4 4	0 0 0 0 0 0 0	No evidence of buried debris.

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
PSN 12/14 A-3	7/14/94	80 x 15 x 6	270	0	Copper wire roll, 1 5-gal. bucket (empty), wood, 1 electric insulator, light fixtures, misc. bottles, transite tiles, 1 5-gal. can (empty, PID = 0.0 ppm), 1 gal. can paint thinner (empty, PID = 0.0 ppm), 3 5-gal. cans (with residual oil), 1 roll steel cable, burn debris, scrap metal.
PSN 12/14 A-4	7/14/94	75 x 8 x 6	135	0	Washing machine, sheet metal, rebar, bottles, cans, broken glass, tent canvas, wooden debris, 1 5-gal. can lubrication oil (empty, PID = 0.0 ppm).
PSN 12/14 A-5	7/14/94	65 x 8 x 6	115	0	Lumber.
PSN 12/14 A-6	7/15/94	80 x 15 x 8	355	0	Metal debris, sheet metal, scrap wire and wood debris, bottles and scrap tin, 1 20-gal. rusted bucket (empty, PID = 0.0 ppm), 1 metal pipe (10 ft x 2 in), tent anchors, telephone pole.
PSN 12/14 A-7	7/15/94	65 x 15 x 8	290	0	Insulated wire, burn pit debris.
PSN 12/14 A-9	7/15/94	8 x 4 x 2 20 x 5 x 4 14 x 4 x 2 14 x 4 x 2 22 x 3 x 4 12 x 4 x 2	2 15 4 4 10 4	0 0 0 0 0 0	No evidence of buried debris.
PSN 12/14 A-10	7/15/94	41 x 11 x 10 25 x 11 x 10	170 100	0 0	Household-type trash, 1 10-gal. lube oil (empty, PID = 0.0 ppm).
PSN 12/14 A-11	7/15/94	80 x 15 x 8	355	0	Burn pit rubble, bottles, cans, paper, 1 stove, 1 55- gal. drum (empty, PID = 0.0 ppm), 1 1-gal. can of dried paint (tested negative for Pb), 1 washing machine.
PSN 12/14 A-11-1	7/15/94	40 x 10 x 8	120	0	Burn pit debris, concrete, burned wood, glass, 1 car battery (segregated), plastic sheeting, 2 1-gal. paint cans (empty).
PSN 12/14 A-12	7/15/94	50 x 5 x 4	35	0	Bottles, burn pit ashes, paper, concrete rubble, oil filters.
PSN 12/14 A-13	7/15/94	95 x 5 x 4	70	0	1 10-ft x 2-in metal pipe, 1 water heater, 1 5-gal. can of engine oil (empty), 1 55-gal. burn barrel, 1 55-gal. crushed drum (empty, PID = 0.0 ppm.), several 1 gal. cans filled with concrete.
PSN 12/14 A-14-2	7/15/94	140 x 15 x 10	780	0	Demolition debris, bottles, deteriorated plywood, burn pit debris, paper, wood, sheet metal, steel pipes (various diameters), concrete, rebar, wall board, cinder blocks, wire mesh, bottles, 3 5-gal. cans.

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
PSN 12/14 A-14-3	7/15/94	65 x 15 x 8	290	0	Assorted demolition rubble, plastic sheeting, reinforcing wire, insulation, wall board, broken glass, wood, plywood, metal pipes, bottles, scrap metal, wire, electronics tubes
PSN 12/14 A-8-1	7/14/94	80 x 15 x 4	180	0	Rusted beverage cans, assorted glass bottles, several 1 gal. paint cans (all empty, PID = 0.0 ppm), wood debris, 1 1 gal. can of hydraulic fluid (empty), 1 dry cell battery, rebar, cable, 1 5-gal. can of engine oil (empty), 2 5-gal. paint cans (empty).
PSN 12/14 A-8-2	7/14/94	80 x 20 x 4	235	0	Many beverage bottles, wire coils, rusted cans, wood debris, demolition debris, burn pit debris, many 1 qt. Purex bottles.
PSN 72/82	NA	NA	NA	0	Geophysical investigations yielded no evidence of buried wastes at the site. No excavation work was conducted.
PSN 90/ A-1	7/13/94	24 x 10 x 2.5 60 x 10 x 2.5	22 55	0	Sheet metal, burned wood, nails, and charcoal (PID=2.0 ppm).
PSN 90/ A-2	NA	NA	NA	0	Not excavated at the direction of the USACE due to similarity to A-1.
PSN 90/ A-3	7/13/94	75 x 6 x 1.5 15 x 5 x 1.5	25 4	0	No evidence of buried waste or disturbed soil (PID=0.0 ppm).
PSN 90/ A-4	NA	NA	NA	0	Not excavated, anomaly not identified until office data reduction.
PSN 90/ A-5	NA	NA	NA	0	Buried pipeline, not excavated.
PSN90/FVR[2]	7/12/94	106 x 23 x 1.5	135	2	Two used oil filters lying on surface, dark gray stained soil (PID=1.0 ppm).
Bridge Overlook Site 1	NA	NA	NA	0	Geophysical investigations yielded no evidence of buried wastes at the site. No excavation work was conducted.
Bridge Overlook Site 2/A-1	7/12/94	20 x 10 x 8	59	0	Burned wood fragments, 1 5-gallon can (rusted) (PID = 0.4 ppm, same as background), 1 2' x 2' piece of sheet metal, 1 5-oz lighter fluid can (rusted and empty), 1 radio battery pack, 1 can of talcum powder, assorted beer cans and bottles.
Bridge Overlook Site 2/A-2	7/12/94	10 x 5 x 5	9	0	1 stove pipe, minor sheet metal, scrap metal, 1 1-gallon paint can (segregated and placed in paint waste drum at H-83-L).
Bridge Overlook Site 2/A-3	7/12/94	5 x 5 x 5	4.5	0	1 8' length of steel cable, empty 1-qt can lubricating oil (PID = 0.4 ppm, same as background)
Bridge Overlook Site 2/A-4	7/12/94	15 x 10 x 8	44	0	Empty 1-qt motor oil can, 1 door knob, assorted wood debris, 1 small piece of sheet metal.

TABLE 4-1 (continued)

SUMMARY OF TRENCHING ACTIVITIES HANFORD NORTH SLOPE LANDFILL CHARACTERIZATION

Site/Anomaly	Excavation Completion Date	Approx. Trench Dimensions (ft) (L x W x D)	Approx. Volume of Material Excavated (cubic yards)	No. of Subsurface Soil Samples (Lab Analysis)[1]	Waste Inventory/Remarks
Igloo 1/A-1	7/14/94	12.5 x 15 x 1.5 50 x 6 x 1.5	10 17	0	Metal stripping (pallet banding?); encountered 8" concrete slab at 2' bgs (PID=0.0 ppm).
Igloo 2/A-1	7/14/94	20 x 5 x 1.5	6	0	Concrete slab at 2' bgs.
TOTAL			17,892		

NA = Not Applicable
[1] Does not include duplicate samples.
[2] FVR = Former Vehicle Rack
[3] Composite sample collected from A-1, A-2, A-3, and A-4. An aliquot was taken from each anomaly with the exception of the VOC sample, which was taken from A-4.
[4] Composite sample collected from A-5 and A-6. An aliquot was taken from each anomaly with the exception of the VOC sample, which was taken from A-6.

Geophysical Anomalies A-1 and A-3 and contaminated soils at a former vehicle maintenance rack were excavated at the PSN 90 Site. Geophysical Anomaly A-2 was not excavated, at the direction of USACE, based on the presence of sheet metal at the surface, which was identical to the sheet metal encountered during the trenching at A-1. Anomaly A-5, suspected to be a buried pipe, was also not excavated at the direction of the USACE. Anomaly A-4 was identified during geophysical data reduction after field excavation activities had been completed. Therefore, this anomaly was not excavated. Geophysical data for this anomaly suggest the presence of a small, shallow buried metal object.

4.3 SAMPLING AND ANALYTICAL RESULTS

All Hanford North Slope samples were collected at the direction of the USACE. Soil and water samples collected during this investigation were sent to a USACE-certified laboratory, Environmental Science and Engineering (ESE), for chemical analysis and subsequent EPA QC Level III data packages. However, chemical analysis and subsequent EPA QC Level IV (CLP-equivalent) data packages were performed on 10 percent of the submitted samples. Total petroleum hydrocarbon (TPH) analyses were conducted on H-06-L samples by ESE. All other TPH analyses were conducted by USACE-contract laboratory NET Pacific, Inc. Quality Assurance/Quality Control (QA/QC) samples collected during the investigation include: soil duplicates, soil split samples (sent to the USACE QA laboratory), equipment rinsates, and trip blanks. The total number of soil and water samples collected by site and the parameters analyzed are presented in Tables 4-2 and 4-3. Sample identification numbers (Hanford Environmental Information System [HEIS]), CDM Federal, and ESE), dates of collection and sample descriptions are summarized in Table 4-4. Analytical results for all soil, debris, and water samples reported during this investigation are included in Appendix C (background samples) and Appendix D (site and waste characterization samples).

At a large number of sites investigated, no suspect hazardous or contaminated materials were encountered. Anomalies at these sites typically contained demolition debris, burn pit refuse, scrap metal, concrete slabs, and other uncontaminated materials. Sampling at these sites was typically limited to background samples or composite samples of material collected from the bottom of exploratory trenches. These "clean sites" are not discussed further in this section.

At other sites, small to large quantities of potentially hazardous or contaminated materials were encountered. At these sites, more sampling was warranted. Samples of waste were collected to confirm contamination and to help identify proper treatment and/or disposal. Samples of native soil material were commonly collected below suspected wastes to determine if all contaminated materials had been removed. The sections below discuss sampling and analytical results for those sites where suspect materials were encountered.

4.3.1 SITE H-06-L WEST/ANOMALY A-4W

On April 25, 1994, during the initial excavation of the A-4W anomaly, onsite PID screening of excavated soil indicated elevated organic vapor emissions of up to 60 ppm at 5 feet below

TABLE 4-2

TOTAL NUMBER OF SOIL/DEBRIS ANALYSES
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Parameter	Analytical Method	H-06-L (West)	H-06-L (East)[3]	H-12-L	H-83-C	H-83-L	PSN 04	PSN 12/14	PSN 90	Bridge Overlook 2	Igloo 1
Volatile Organic Compounds	SW-846 8260	23	15	1	2	5	3	2	3	1	1
Semi-Volatile Organic Compounds	SW-846 8270	23	15	1	2	5	4	2	3	1	1
Pesticides/PCBs	SW-846 8080	23	15	1	2	5	4	2	3	1	1
8 RCRA Metals[1]	SW-846 6010/7000	23	21	1	2	6	3	2	3	1	1
Total Petroleum Hydrocarbons	418.1W[2]	23	15	1	2	6	3	2	3	1	1

[1] As, Ba, Cd, Cr, Pb, Hg, Se, Ag.
[2] Washington State Modified Method; includes WTPH-HCID (hydrocarbon identification), WTPH-G (gasoline), WTPH-D (diesel), and WTPH-418.1 Modified (heavier oils).
[3] Includes an offsite sample of clean fill for backfilling the A-04-W and A-01-E trenches.

TABLE 4-3

TOTAL NUMBER OF AQUEOUS SAMPLES
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Parameter	Analytical Method	H-06-L (West)	H-06-L (East)	H-83-L	PSN 04	PSN 90
Volatile Organic Compounds	SW-846 8260	4	1	2	1	1
Semi-Volatile Organic Compounds	SW-846 8270	2	1	1	1	1
Pesticides/PCBs	SW-846 8080	2	2	1	1	1
8 RCRA Metals[1]	SW-846 6010/7000	2	1	1	1	1
Total Petroleum Hydrocarbons	418.1	2	1	1	1	1

[1] As, Ba, Cd, Cr, Pb, Hg, Se, Ag.

TABLE 4-4

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
H-06-L	4/19/94	BOBSW3	94H06L(W) -A20-01-004	1	Sample of soil beneath rusted, crushed 5-gal. can. No evidence of hazardous materials or stained soil.
H-06-L	4/19/94	BOBSW4	94H06L(W) -A20-02-006	2	Soil sample from beneath buried wastes; wastes contained several rusted, crushed drums. No evidence of hazardous materials or contamination.
H-06-L	4/19/94	BOBSW5	94H06L(W) -A19-01-008	3	Suspected "clean" soil sample from beneath an oily 5-gal. can segregated on port a-pad as petroleum-contaminated material. Slight PID response inside 5-gal. can (2 ppm above background).
H-06-L	4/20/94	BOBSW6	94H06L(W) -A19-02-007	4	Sample from an area of oily soils and an oily rag segregated on port-a-pad as petroleum-contaminated material. PID response 5 ppm above background.
H-06-L	4/20/94	BOBSW7	94H06L(W) -A19-03-005	5	Sample collected from within a rusted and collapsed drum. No evidence of hazardous materials or contamination other than occurrence of drum. Material segregated to port-a-pad.
H-06-L	4/20/94	BOBSW8	94H06L(W) -A19-04-005	6	Duplicate of 94H06L(W) -A19-03-005.
H-06-L	4/21/94	BOBSW9	94H06L(W) -A17-01-003	7	Sample of oily soil beneath crushed 5 gal can containing oily residue. Stained soil and can segregated on port-a-pad as petroleum-contaminated material.
H-06-L	4/22/94	BOBSX0	94H06L(W) -A16-01-002	8	Sample from within a crushed 55-gal drum containing hardened, black residual material. PID response of 12-15 ppm above background inside drum. Drum and soil segregated to port-a-pad.
H-06-L	4/22/94	BOBSX1	94H06L(W) -A16-02-003	9	Sample of "clean" soil from beneath drum sampled as 94H06L(W) -A16-01-002.
H-06-L	4/22/94	BOBSX2	94H06L(W) -A07-01-001	10	Sample of soil directly below 6 crushed 1 gal insecticide (DDT and chlordane) cans. Cans and soils segregated to port-a-pad.

TABLE 4-4 (continued)

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
H-06-L	4/23/94	BOBSX3	94H06L(W) -A07-02-005	11	Sample of "clean" soils collected beneath insecticide cans and soils sampled as 94H06L(W) -A-07-01-001. Sample split with USACE QA lab.
H-06-L	4/23/94	BOBSX4	94H06L(W) -A05-01-EB1	1	Equipment rinsate blank.
H-06-L	4/23/94	BOBSX5	94H06L(W) -A05-01-004	12	Sample of "clean" soil collected from beneath a drum segregated to port-a-pad as paint wastes. PID response inside drum was 60 ppm above background.
H-06-L	4/23/94	BOBSX6	94H06L(W) -A05-01-TB1	2	Trip blank.
H-06-L	4/25/94	BOBSX7	94H06L(W) -A05-02-003	13	Sample of soil from within a rusted, crushed 55-gal. drum segregated to port-a-pad. Drum contained a black tar-like residual material with a positive PID response of 10 ppm above background.
H-06-L	4/25/94	BOBSX8	94H06L(W) -A05-03-004	14	Sample of "clean" soil from beneath drum sampled as 94H06L(W) A05-02-003.
H-06-L	4/25/94	BOBSX9	94H06L(W) -A04-01-005	15	Petroleum-contaminated soil sample from anomaly which eventually yielded approx. 200 cu yds of contaminated soil. All suspected contaminated materials segregated to plastic sheets and secured.
H-06-L	4/25/94	BOBSY0	94H06L(W) -A04-02-012	16	Suspected "clean" soil sample from beneath soil sampled as 94H06L(W) -A04-01-005. This material was eventually segregated to plastic sheets as petroleum-contaminated material.
H-06-L	4/27/94	BOBSY1	94H06L(E) -A14-01-001	17	Sample of soil from beneath a single insecticide can. Soil and can segregated to port-a-pad.
H-06-L	4/27/94	BOBSY2	94H06L(E) -A14-02-001	18	Duplicate of 94H06L(W) -A14-01-001.
H-06-L	4/27/94	BOBSY3	94H06L(E) -A12-01-010	19	Oily soil from the area of a crushed 55-gal. drum. Drum and soil segregated to plastic sheet as petroleum-contaminated material. Sample split with USACE QA lab.

TABLE 4-4 (continued)

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
H-06-L	4/27/94	BOBSY4	94H06L(E) -A12-01-012	20	Sample of "clean" soil collected from beneath soil sampled as 94H06L-A12-01-010.
H-06-L	4/29/94	BOBSY5	94H06L(E) -A11-01-007	21	Sample of "clean" soil collected from beneath several 5-gal. cans and a 55-gal. drum containing a black tar-like residue. Drum, cans, and potentially contaminated soils removed to port-a-pad. EPA Level IV.
H-06-L	5/2/94	BOBSY6	94H06L(E) -A01-01-010	22	Sample of soil from A-le spoil pile. Soil had a hydrocarbon odor and a positive response on PID (6-15 ppm above background). Later determined to be contaminated with DDT.
H-06-L	5/3/94	BOBSY7	94H06L(0) -CS1-01-000	23	Clean fill material for refilling and grading A-4w and A-le
H-06-L	5/3/94	BOBSY8	94H06L(E) -BG1-01-002	24	Background soil sample, H-06-L (east). Sample split with Washington Department of Ecology.
H-06-L	5/3/94	BOBSY9	94H06L(E) -SV1-01-001	25	Composite surface soil from "stressed vegetation" areas, H-06-L (east). Sample split with Washington Department of Ecology.
H-06-L	5/3/94	BOBSZ0	94H06L(W) -BG2-01-002	26	Background soil sample, H-06-L (west).
H-06-L	5/3/94	BOBSZ1	94H06L(W) -BG2-02-002	27	Duplicate of sample 94H06L(W) -BG2-01-002.
H-06-L	5/4/94	BOBSZ2	94H06L(W) -A04-03-020	28	"Clean Soil" sample from bottom of the A-4w excavation. Sample split with USACE QA lab.
H-06-L	5/4/94	BOBSZ3	94H06L(W) -A04-04-008	29	Sample of soil from A-4w excavation with positive PID response (25-30 ppm above background). Sample split with Washington Department of Ecology. EPA Level IV.
H-06-L	5/4/94	BOBSZ4	94H06L(W) -SV2-01-001	30	Composite surface soil from "stressed vegetation" areas, H-06-L (west). EPA Level IV.
H-06-L	5/4/94	BOBSZ5	94H06L(W) -BG3-01-002	31	Background soil sample, H-06-L (west).
H-06-L	5/4/94	BOBSZ6	94H06L(W) -BG3-01-TB2	4	Trip blank.

TABLE 4-4 (continued)

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
H-06-L	5/4/94	BOBSZ7	94H06L(W) -WC1-01-000	32	Waste characterization sample, tar-like material and associated soils, H-06-L (west).
H-06-L	5/4/94	BOBSZ8	94H06L(W)-WC2-01-000	33	Waste characterization sample, paint wastes and associated soils, H-06-L (west).
H-06-L	5/9/94	BOBSZ9	94H06L(W)-SV2-01-EB2	11	Equipment rinsate blank.
H-06-L	5/11/94	BOBT00	94H06L(E)-A01-02-005	34	Composite sample of soil and wastes from the A-1 East Anomaly spoil pile. Sample split with USACE QA lab.
H-06-L	5/13/94	BOBT01	94H06L(E) A01-03-005	35	Duplicate of 94H06L(E)-A01-02-005.
H-06-L	5/13/94	BOBT02	94H06L(E)-A01-04-014	36	Sample of "clean" soil from bottom of the A-1 East Anomaly excavation. EPA Level IV.
H-06-L	5/13/94	BOBT03	94H06L(E)-A01-05-012	37	Sample of "clean" soil from east wall of the A-1 East Anomaly excavation.
H-06-L	5/13/94	BOBT04	94H06L(E)-A01-06-010	38	Sample of "clean" soil from west wall of the A-1 East Anomaly excavation.
H-06-L	5/13/94	BOBT05	94H06L(E)-WW1-01-000	13	Waste water from decontamination of sampling equipment
H-06-L	6/6/94	BOBT06	94H06L(E)-A01-07-008	39	Sample of DDT contaminated soil taken from the bottom of the A01E excavation (NW corner, 8 ft. bgs). This sample correlates to onsite analysis; A01E-35-08 (1-10 ppm DDT).
H-06-L	6/7/94	BOBT07	94H06L(E)-A01-08-011	40	Sample of "clean soil" from the wall of the A01E excavation (NE side, 11 ft. bgs), Level IV analysis. This sample correlates to onsite analysis; A01E-42-11 (<1 ppm DDT).
H-06-L	6/7/94	BOBT08	94H06L(E)-A01-09-011	41	Duplicate of soil sample 94H06L(E)-A01-08-011.
H-06-L	6/7/94	BOBT09	94H06L(E)-A01-10-011	42	Sample of "clean soil" from the wall of the A01E excavation (NW side, 11 ft. bgs). This sample correlates to onsite analysis; A01E-43-11 (<1 ppm DDT).

TABLE 4-4 (continued)

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
H-06-L	6/7/94	BOBT10	94H06L(E)-A01-11-012	43	Sample of "clean soil" from the bottom of the A01E excavation (NW side, 12 ft. bgs). This sample correlates to onsite analysis; A01E-52-12 (<1 ppm DDT). Sample was split with USACE QA Lab
H-06-L	6/7/94	BOBT11	94H06L(E)-A01-12-012	44	Sample of "clean soil" from the bottom of the A01E excavation (NE corner, 12 ft bgs). This sample correlates to onsite analysis; A01E-53-12 (<1 ppm DDT)
H-06-L	6/8/94	BOBT12	94HO6L(E)-A01-09-EB3	21	Equipment rinsate blank.
H-06-L	6/8/94	BOB398	94H06L(E)-WW2-02-000	14	Waste water from the decontamination of sampling equipment.
H-12-L	8/10/94	BOC3G1	94H12L-BG1-01-001	13	Background soil sample taken 80' west of SW corner of geophysical survey boundary.
H-83-C	7/15/94	BOC3C4	94H83C-BKG-01-002	5	Background sample from Site H-83-C, split with USACE QA laboratory.
H-83-C	7/15/94	BOC3C5	94H83C-BKG-02-002	6	Duplicate of 94H83C-BKG-01-002.
H-83-L	6/15/94	BOC399	94H83L-A06-01-001	1	Sample of diesel contaminated soil taken from the surface at the A6 anomaly. This sample correlates to onsite analysis; A6-01 (500 ppm diesel).
H-83-L	6/16/94	BOC3B0	94H83L-BG1-01-002	2	Background soil sample taken south of H-83-L Landfill (outside of the HLA geophysical grid). Sample split with USACE QA Laboratory.
H-83-L	6/16/94	BOC3B1	94H83L-A06-02-002	3	Sample of "clean soil" collected beneath the surficial diesel contaminated soil at A6. This sample correlates to onsite analysis; A6-02 (ND diesel).
H-83-L	6/16/94	BOC3B2	94H83L-A06-03-002	4	Duplicate of soil sample 94H83L-A06-02-002.
H-83-L	6/17/94	BOC3B3	94H83L-CS2-02-000	5	Clean fill material from a second source located approximately 2 miles east of H-83-L on Highway 24 for refilling and grading additional excavations.

TABLE 4-4 (continued)

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
H-83-L	6/17/94	BOC3B4	94H83L-A06-02-EB1	1	Equipment rinsate blank, split with USACE QA Lab.
H-83-L	6/20/94	BOC3B5	94H83L-A03-01-005	6	Soil sample taken from within a rusted 5-gallon container, previously excavated and segregated from the A3 anomaly. This sample correlates to onsite analysis A3-01 (<1,000 ppm diesel). Soil was discolored and oily, Level IV analysis.
H-83-L	6/20/94	BOC3B6	94H83L-A03-01-TB1	10	Trip Blank.
PSN 04	8/9/94	BOC3F8	94PSN04-A1/4-004	10	Composite sample collected in native material at base of excavation. One aliquot taken from A-1 through A-4.
PSN 04	8/9/94	BOC3F7	94PSN04-DS-001-02	100	Black viscous sludge in 55-gal drum discovered in A-1 East (PID=75.0 ppm inside drum)
PSN 04	8/10/94	BOC3F9	94PSN04(S)-BG01-01-001	11	Background soil sample taken 38' west and 5' south of NE corner of PSN 04(S).
PSN 04	8/10/94	BOC3G0	94PSN04(S)-A04/05-003	12	Composite sample collected in native material at base of excavation. One aliquot taken from A-5 and A-6 (CDM Federal) AKA A-1(S) and A-1(N).
PSN 04	8/11/94	BOC3G4	94PSN04W-A05/06-01-EB1	3	Equipment rinsate blank, split with USACE QA Lab.
PSN 12/14	7/15/94	BOC3C6	941214-BG1-01-002	42	Background sample from PSN 12/14 Site.
PSN 12/14	7/15/94	BOC3C7	941214-WC1-01-000	43	Composite waste characterization sample of oily soils from PSN 12/14, Anomalies A-1 and A-3.
PSN 90	7/12/94	BOC3B8	94PSN90-VR-01-003	1	Composite sample of "clean soil" from base of excavation at former vehicle maintenance rack.
PSN 90	7/12/94	BOC3B9	94PSN90-VR-02-001	2	Composite sample from hydrocarbon contaminated soil pile excavated from former vehicle rack area.
PSN 90	7/13/94	BOC3C2	94PSN90-BKG-01-002	3	Background soil sample taken about 360' SE of former vehicle rack.

TABLE 4-4 (continued)

SAMPLE SUMMARY
HANFORD NORTH SLOPE
LANDFILL CHARACTERIZATION

Site	Date Collected	HEIS #	CDM Federal #	ESE #	Description/Remarks
PSN 90	7/13/94	BOC3C1	94PSN90-VR-01-EB1	3	Equipment rinsate blank, split with USACE QA Lab.
Bridge Overlook 2	7/12/94	BOC3C0	94BOV2-BG1-01-002	41	Background sample from Bridge Overlook Site 2.
Igloo 1	7/14/94	BOC3C3	94IGL-BKG-01-002	4	Background soil sample taken about 60' south of Igloo 1.

ground surface (bgs). At the direction of the USACE, soil sample 94H-06-L (W)-A04-01-005 was obtained from five feet bgs in order to characterize the soil contamination. In addition, a second soil sample (94H-06-L (W) -A04-02-012) was obtained from a depth of 12 feet bgs to determine the depth of contamination. Total petroleum hydrocarbons (TPHs) were detected in both 94H-06-L (W) -A04-01-005 and 94H-06-L (W)-A04-02-012 with concentrations of 2,040 mg/kg and 381 mg/kg, respectively. In addition low concentrations of polycyclic aromatic hydrocarbons (PAHs) (dibenzofuran 380 µg/kg; 2-methylnaphthalene 3,600 µg/kg; naphthalene 960 µg/kg; and phenanthrene 570 µg/kg) and DDT (67.8 µg/kg) were detected in 94H-06-L (W)-A04-01-005. Because of the elevated levels of TPHs discovered at depth, excavation at the A-4W anomaly was halted pending consultation with regulatory agencies regarding appropriate cleanup levels. After conferring with the Washington Department of Ecology (Ecology) the USACE directed that an action level of 100 mg/kg was to be used as a guideline for the removal of soil contaminated with petroleum hydrocarbons. This value represents the more conservative of two TPH cleanup levels required by the Washington State Model Toxics Control Act (WAC 173-340) and actually applies to soils contaminated by gasoline.

On May 3, 1994, excavation of the A-4W anomaly resumed in the area where TPH contaminated soil had been previously removed (south end of the anomaly). PID readings were obtained from each scoop (2 cy) of excavated soil. As the excavation proceeded to 18 feet bgs, PID readings ranged from 2 to 70 ppm. Generally, PID readings decreased as the A-4W trench was expanded from the original excavation (4/25/94). Another characterization soil sample (94H-06-L (W)-A04-04-008) was obtained along the northern perimeter of the A-4W trench, eight feet bgs and split with Ecology. PID readings ranged from 20-30 ppm in the vicinity of this sample. Petroleum hydrocarbons were detected in this sample at a concentration of 82 mg/kg. As the excavation approached 20 feet bgs, PID readings diminished to background levels and there was no evidence of visual soil staining. Soil sample 94H-06-L (W)-A04-03-020 was taken at 20 feet bgs, to confirm the absence of contamination at the bottom of the A-4W excavation. Petroleum hydrocarbons, PAHs, and pesticides were not detected in this sample.

The excavation of A-4W was discontinued when PID readings were observed to be at background levels and there was no further visual evidence of soil contamination. In total, approximately 200 cy of petroleum hydrocarbon contaminated soil was segregated and stockpiled on and covered with 6 mil thick visqueen sheeting for later determination of appropriate treatment and/or disposal. The A-4W trench was backfilled, compacted, and regraded with "clean" soil from the A-4W excavation and with fill material transported from a source located six miles east of the site. A sample of this fill material (94H06L[0]-CS1-01-000) had been previously analyzed to confirm that the soil was "clean."

4.3.2 SITE H-06-L EAST/ANOMALY A-1E

Excavation of the A-1E anomaly began on May 2, 1994; the majority of excavated material consisted of demolition debris (lumber, sheet metal, plywood, concrete blocks, pipes and rebar). As the excavation progressed to the southern boundary of the anomaly, onsite staff noted an unusual odor. Soil appeared moist and cohesive and had a "solvent-like" or "insecticide-like" odor. PID readings obtained near this soil ranged from 6-8 ppm above background. At the direction of USACE, sample 94H-06-L (E)-A01-01-010 was obtained from 10 feet bgs to characterize the soil. DDT and associated breakdown by-products, DDD and DDE, were detected at concentrations of 2,080 mg/kg, 786 mg/kg and 44.4 mg/kg, respectively. PAHs detected in this sample include: 2-methylnaphthalene (77 mg/kg); naphthalene (3.2 mg/kg); phenanthrene (16 mg/kg); and pyrene (5.4 mg/kg). TPH was detected at 4,920 mg/kg in this sample.

Although no insecticide cans were recovered from the A-1E excavation, it is suspected that the insecticide detected in the A-1E trench is similar in composition to the empty 1-gallon cans labelled "Insecticide, Roach and Ant Control" found in the A-7W and A-14E excavations. The ingredients listed on the labels of these containers included: DDT 5%, chlordane 2%, kerosene 77.9%, auxiliary solvent 15%, and an odor neutralizer 0.1%.

Ecology established 1 mg/kg (1 ppm) as the action level for the removal of soil contaminated with DDT from the A-1E excavation. Due to the low volatility of DDT and kerosene (and, therefore, the inability to confidently screen for these contaminants with direct-reading instruments), Enviroguard™ Field Test Kits were used to screen soil for potential DDT contamination. The Enviroguard™ Field Test Kits for DDT have a 1 ppm detection limit. Onsite analysis (utilizing Enviroguard™ Test Kits) of the segregated piles indicated DDT contamination greater than 10 ppm. A composite sample (94H-06-L (E)-A01-02-005) and a duplicate sample (94H-06-L (E)-A01-03-005) were obtained from the segregated piles to confirm the onsite analysis. DDT was detected in both samples with concentrations of 695 mg/kg and 611 mg/kg respectively. All of the soil from the segregated piles that was determined through onsite screening to have DDT concentrations greater than 1 ppm (1 mg/kg) was then stockpiled on, and covered with, 6 mil thick plastic sheeting.

On May 12, 1994 excavation of the A-1E anomaly resumed along the southern boundary of the existing trench. Enviroguard™ Soil Test Kits were used to screen the soil for DDT concentrations in order to determine the extent of the excavation. A total of 34 onsite analyses were performed with the Enviroguard™ Soil Test Kits under this phase of the field program. Three soil samples for offsite analysis were obtained along the southern perimeter of the A-1E trench. Soil samples; 94H-06-L (E)-A04-04-014, 94H-06-L (E)-A01-05-012 and 94H-06-L (E)-A01-06-010 were taken from the bottom, east wall and west wall of the excavation in areas that had onsite screening results of less than 1 ppm. DDT concentrations for these samples ranged from 0.004 to 0.184 mg/kg (ppm), well below the action level of 1 ppm established by Ecology.

Removal of DDT-contaminated soil (above 1 ppm DDT) from the A-1E anomaly was completed under a separate field mobilization. Removal of contaminated soils from the A-1E anomaly resumed along the northern perimeter on June 6, 1994. During this phase of the DDT-contaminated soil removal, Enviroguard™ Soil Test Kits were again utilized to screen soil for DDT contamination. A total of 19 onsite analyses were performed with these soil test kits. In addition, six subsurface soil samples (including one duplicate), one equipment rinsate sample, and one decontamination wastewater sample were sent to ESE for offsite Pesticide/PCB (SW-846 Method 8080) analysis. Sample identification numbers (HEIS, CDM Federal, and ESE), dates of collection and sample descriptions are summarized in Table 4-4. Analytical results for all soil and water samples obtained from the A-1E anomaly during this soil removal operation are included in Appendix D.

On June 6, 1994, soil sample 94H-06-L(E)-A01-07-008 was taken from the A-1E excavation (NW corner 8 ft bgs) to verify the accuracy of the Enviroguard™ soil test (onsite analysis). This sample had an onsite DDT screening result indicating the presence of DDT at a concentration between 1 - 10 ppm. Offsite analysis of this sample detected DDT at a concentration of 2.23 mg/kg, verifying the accuracy of the onsite screening. This offsite analysis also detected DDD, DDE, and dieldrin at concentrations of 0.148 mg/kg, 0.210 mg/kg, and 0.164 mg/kg, respectively. Five samples were obtained along the northern perimeter of the A-1E trench for offsite analysis. Soil samples, 94H-06-L(E)-A01-08-011, 94H-06-L(E)-A01-09-011, 94H-06-L(E)-A01-10-011, 94H-06-L(E)-A01-11-012, and 94H-06-L(E)-A01-12-012, were taken from the northeast and northwest walls and the bottom of the excavation from areas that had onsite screening results of less than 1 ppm DDT.

The excavation of A-1E was discontinued when onsite screening results indicated that all soil containing DDT at concentrations exceeding 1 ppm (1 mg/kg) had been removed. Approximately 600 cy of DDT-contaminated soil had been segregated and stockpiled on and covered with 6-mil thick visqueen for later determination of appropriate treatment and/or offsite disposal. The A-1E trench was backfilled, compacted, and regraded utilizing clean fill transported from a source located 6 miles east of the site (reference sample 94H06L(0)-CS1-01-000).

4.3.3 SITE H-06-L/MISCELLANEOUS WASTE SAMPLING

At the conclusion of excavation and waste segregation activities at the H-06-L Site (excluding excavation of DDT-contaminated soils at Anomaly A-1 East), small quantities of like wastes accumulated on Port-A-Pads were consolidated. Waste types consolidated included paint wastes and associated contaminated soils, tar-like wastes and associated soils, and insecticide cans and associated soils. Composite samples of paint wastes (94H06L(W)-WC2-01-000) and tar-like wastes (94H06L(E)-WC1-01-000) were collected in order to characterize these materials for disposal. Both samples were analyzed for VOCs, SVOCs, RCRA metals, pesticides/PCBs, and TPH. The paint waste sample (94H06L(W)-WC2-01-000) contained lead at a concentration of 1810 mg/kg, xylene at 220 µg/kg, several phthalates (530 to 1,600 µg/kg), PAHs (2-methyl-naphthalene [140 µg/kg], naphthalene [250 µg/kg]), and low levels of pesticides (DDT [161 µg/kg]), DDD [15.1 µg/kg], DDE [25 µg/kg]). The tar-like waste (94H06L(E)-WC1-01-000) contained petroleum hydrocarbons (255 mg/kg), lead (1,140 mg/kg), PAHs (total 196.5 mg/kg), and pesticides (DDT [356 µg/kg], DDD [150 µg/kg], DDE [422 µg/kg]).

4.3.4 SITE H-83-L/ANOMALY A-3

On June 16, 1994, a 5-gallon can containing oily/discolored soil was excavated from the A-3 trench. Field screening using the Hanby™ soil test kit indicated that the soil contained >1,000 ppm diesel. The 5-gallon can and its contents were segregated and placed on 6-mil plastic visqueen. There was no evidence (visual or from PID field screening) of contaminated soil surrounding the 5-gallon can in the trench. On June 20, 1994, at the direction of USACE, soil sample 94H83L-A03-01-005 was obtained from within the 5-gallon can for characterization. Heavy oils were detected with a concentration of 90,400 mg/kg; diesel and gasoline were not detected in the WTPH-HCID analysis performed by USACE-contracted laboratory NET Pacific. In addition, low concentrations of several volatile organic compounds (VOCs) (2-hexanone 13 ug/kg; acetone 95 ug/kg; and 2-butanone 35 ug/kg) were detected in 94H83L-A03-01-005. No other VOCs, Semi-Volatile Organic Compounds (SVOCs), or Pesticide/PCBs were detected in this sample.

Ecology has established 200 mg/kg as the action level for the removal of soil contaminated with heavy oils. The 5-gallon can and oily soil contents were covered with 6-mil thick visqueen sheeting for later treatment and/or disposal.

4.3.5 SITE H-83-L/ANOMALY A-6

The A-6 anomaly consisted of a debris pile containing 7 telephone poles, 64 1-quart cans of General Purpose Lubricating Oil (MIL-L-3150, American Oil and Supply Company, Newark, NJ), and assorted scrap wood. The EM and Magnetometer Survey conducted by HLA on June 15, 1994, indicated no evidence of buried metal or disturbed soil after the debris pile was removed.

Upon completing the excavation of the A-2 anomaly on June 15, 1994, the telephone poles and scrap wood from A-6 were placed into the A-2 trench prior to refilling and grading. The 64 1-quart cans of lubricating oil were double bagged and placed into a DOT-approved 55-gallon drum. Oil-stained soil was observed in the vicinity of the 64 1-quart lubricating oil cans after their removal. Field screening, using a Hanby™ soil test kit, indicated that the soil contained approximately 500 ppm diesel. At the direction of USACE, soil sample 94H83L-A06-01-001 was obtained to characterize the oil-stained soil at A-6. Heavy oils were detected at a concentration of 14,900 mg/kg; diesel and gasoline were not detected in the WTPH-HCID analysis. Lead was also detected at a concentration of 11.6 mg/kg.

On June 16, 1994, approximately two cubic yards of oil-stained soil were removed from the surface at the A-6 anomaly. Soil sample 94H83L-A06-02-002 and duplicate sample 94H83L-A06-03-002 were obtained from 2 feet bgs to confirm that all of the oil-stained soil from the surface of the A-6 anomaly had been removed. Heavy oils, diesel, gasoline, VOCs, SVOCs, and Pesticide/PCBs were not detected in either sample.

Approximately 2 cubic yards of oil-stained soil from the A-6 anomaly were segregated and stockpiled on and covered with 6-mil thick visqueen for treatment and/or offsite disposal. The A-6 trench was backfilled and graded with clean soil from the H-83-L site.

4.3.6 SITE PSN 04/ANOMALIES A-1/A-6

During excavation of the A-1 anomaly on August 9, 1994, a partially full 55-gallon drum was uncovered. The PID read 75 ppm inside the drum. The 55-gallon drum was segregated and placed on plastic visqueen. There was no evidence (visual or from PID field screening) of contaminated soil surrounding the 55-gallon drum in the trench. At the direction of the USACE, waste characterization sample 94PSN04-DS-001-002 was collected from the black, viscous "tar-like" material inside the drum which was about one-quarter full of the material. Low concentrations of polycyclic aromatic hydrocarbons (2-methylnaphthalene [64.0 mg/kg], and naphthalene [15.0 mg/kg]) were detected in this sample.

Other samples collected at the PSN 04 site were two composite samples of "clean" material taken from the base of each excavation after excavation and screening were completed. Sample 94PSN04-A1/4-004 was collected from anomalies A-1 through A-4, with an aliquot taken from each anomaly excavation. Sample 94PSN04-A04/05-003 was taken from anomalies A-5 and A-6.

4.3.7 SITE PSN 12/14/ANOMALIES A-1/A-3

On July 14, 1994, during excavation of anomalies A-2 and A-3 at the PSN 12/14 Site, several 5-gallon cans with residual oil were encountered. These cans and associated oily soils were segregated for offsite disposal. At the direction of the USACE, a composite sample (941214-WC1-01-000) was collected to characterize these materials for appropriate disposal. This sample was analyzed for RCRA metals, VOCs, SVOCs, pesticides/PCBs, and WTPHs. Petroleum hydrocarbons were detected at a concentration of 65,000 mg/kg. The hydrocarbon identification analysis (WTPH-HCID) identified heavy oils at 35,000 mg/kg. Other analytes detected included: pesticides (aldrin [6.35 µg/kg], alpha-BHC [2.52 µg/kg], DDE [21.3 µg/kg], DDT [6.37 µg/kg], endrin [194 µg/kg], heptachlor [26 µg/kg]) and acetone (17 µg/kg).

4.3.8 SITE PSN 90/FORMER VEHICLE RACK

As part of the PSN 90 Site investigation, a former vehicle maintenance rack at the site was excavated and remediated. Evidence of potential petroleum hydrocarbon contamination at the former vehicle maintenance rack consisted of dark gray-stained soil and several oil filters lying on the surface. Excavation took place on July 12, 1994, and all excavated soils were placed on 6-mil plastic sheeting. Approximately 240 cubic yards of hydrocarbon contaminated soil were removed from the former vehicle rack area and staged on 6-mil plastic sheeting. When all potentially-contaminated soil had been excavated based on visual evidence, five soil samples were collected for analysis with Hanby™ Field Test Kits for hydrocarbons in soil. The five samples, collected along the length of the former vehicle rack, were analyzed onsite. Results for four of the five samples indicated petroleum hydrocarbon concentrations below the Washington State standard of 200 mg/kg (200 ppm) for diesel or heavy oil-contaminated soils, while the fifth sample contained approximately 200 mg/kg diesel. Excavation resumed where the Hanby™ sample indicated contamination in excess of the standard. After further excavation, a sample collected in the same area was determined to contain heavy petroleum hydrocarbons at concentrations below the 200 mg/kg standard. A composite soil sample, 94PSN90-VR-01-003, was collected of the "clean material" in the bottom of the excavation and submitted for laboratory analysis. Offsite laboratory analysis indicated no hydrocarbon contamination in this sample. A composite soil sample, 94PSN90-VR-02-001, was collected from the contaminated soil pile and submitted for laboratory analysis. This sample had total recoverable petroleum hydrocarbons-Washington method (TRPH-W) and heavy oil concentrations of 1,760 mg/kg and 1,860 mg/kg, respectively.

4.4 ANALYSIS OF BACKGROUND DATA

A total of 13 background soil samples were collected from sites on the Hanford North Slope in order to form a base of comparison with samples collected from the landfills. Background samples were analyzed for the same compounds as the landfill samples, with the exception of the test for petroleum hydrocarbons. The background soil samples were collected from outside of the potential landfill areas as delineated by the USACE, but generally within a few hundred feet of the site with which it is associated. The samples were collected from approximately 2 feet below ground surface in order to reduce the potential for surface contamination. Appendix C consists of a table presenting the concentrations for compounds detected in each of the background samples. The table also contains the average, the range, and the standard deviation for all detected values among the samples. These statistics can be used to evaluate whether compound levels in the Hanford North Slope samples are elevated. Three of the background samples were collected from Site H-06-L West, and one each from Sites H-06-L East, H-83-L, Bridge Overlook 2, PSN-12/14, PSN-90, Igloo, PSN-04, H-12-L, and a duplicate sample from H-83-C.

Three EPA Priority Metals--arsenic, barium, and chromium--were detected in all 13 samples. Arsenic levels ranged from 1.02-6.71 mg/kg, with an average value of 3.30 mg/kg. Barium concentration varied from 34.9-136 mg/kg, averaging 98.28 mg/kg. Chromium detections ranged from 3.73-12.5 mg/kg, with an average concentration of 8.10 mg/kg.

Acetone was detected at a level of 20 ug/kg in the sample collected from Site H-83-L. No VOCs were detected in any other background soil samples.

DDT and its breakdown products, DDD and DDE were detected in several of the background samples. DDT was detected in two of the three samples collected from Site H-06-L West and also in the sample from H-06-L East. The highest background concentration of DDT was found in the H-06-L East sample, at 12.9 ug/kg; the two other detections were under 2 ug/kg.

DDE was detected in the H-06-L East and PSN-04 samples at less than 2 ug/kg, while DDD was found only in the H-06-L East sample at 8.02 ug/kg.

Three phthalate compounds were detected in varying concentrations throughout the background samples. Bis-(2-ethylhexyl) phthalate was detected in 7 of the 13 samples, ranging in value from 120-4500 ug/kg and averaging 1071.43 ug/kg Di-n-butyl phthalate was found only in the sample from the Igloo Site, at a concentration of 1800 ug/kg.

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5.0 QUALITY ASSURANCE/QUALITY CONTROL

This section discusses QA and QC procedures regarding the CDM Federal subcontract laboratory utilized for sample analyses. A cursory or summary review of data was completed in order to provide a limited assessment of data quality. Field QA/QC is also discussed, particularly deviations from the work plan and QAPjP.

5.1 LABORATORY

The laboratory analytical work associated with the Hanford North Slope sites was completed by CDM Federal subcontract laboratory, Environmental Science and Engineering, Inc. (ESE) of Gainesville, Florida.

Additionally, TPH analyses (for all sites except H-06-L) and QA analyses were conducted by laboratories contracted to USACE North Pacific Division Laboratory. This report does not include an evaluation of the quality of the data generated by USACE contract laboratories.

Table 5-1 summarizes the total number of samples submitted for analysis.

5.2 CHEMICAL DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative goals and limits established for field and laboratory data that provide the means by which data reviewers can assess whether the goals of an investigation have been met. The qualitative objectives provide descriptions of what questions must be answered, what data must be collected, how the data will be collected, what analyses are required, and how the data will be used. Essentially, the qualitative objectives provide descriptions of how the data will be used to support site restoration decisions. Qualitative DQOs for this field investigation are reviewed in the following section.

Quantitative DQOs establish numeric limits for acceptable results. The numeric limits aid in establishing a level of confidence and the degree of usefulness for the data collected as part of the field investigation. The numeric limits are tied directly to the intended end use of the data and include analytical detection limits, precision, accuracy, QC frequency, and completeness.

The QA/QC data quality effort, as defined in the Work Plan for Landfill Characterization and Remediation, Site H-06-L, Hanford North Slope, Washington and Addenda (CDM Federal 1994a-g), was to obtain EPA data quality Levels I, III, and IV data.

5.2.1 METHOD DETECTION LIMITS

Method detection limits vary with analytical method, matrix type, and concentration of interfering contaminants. The method detection limits presented in the Work Plan for

TABLE 5-1

SUMMARY OF SAMPLES SUBMITTED
FOR ANALYSIS

Site	Soil/Waste		Aqueous	
	No. of Samples	Analytical Parameters	No. of Samples	Analytical Parameters
H-06-L (West)	23	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH	2	VOC
			2	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH
H-06-L (East)	15	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH	1	SVOCs, Pest/PCBs, 8 RCRA Metals, TPH
	6	Pesticides/PCBs		
H-12-L	1	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH		
H-83-C	4	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH		
	1	8 RCRA Metals		
H-83-L	5	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH	1	VOC
	1	8 RCRA Metals, TPH	2	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH
PSN 04	3	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH	1	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals
	1	SVOCs, Pest/PCBs		
PSN 12/14	2	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals TPH		
PSN 90	3	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals TPH	1	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals, TPH
Bridge Overlook	1	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals TPH		
Igloo	1	VOCs, SVOCs, Pest/PCBs, 8 RCRA Metals TPH		

Landfill Characterization and Remediation, Site H-06-L, Hanford North Slope, Washington, QAPjP (Appendix A), Section 5.3.6, establish goals for all samples collected and submitted to the analytical laboratory for analysis. Selected samples, in some cases, may have required analysis by more than one method (e.g., ICP and AA metals) to achieve the appropriate detection limits for all analytes.

5.2.2 PRECISION

Precision is a quantitative term that estimates the reproducibility of measurements under a given set of conditions. The acceptability of the precision can be determined if the reported value is less than the Required Quantitation Limit.

Precision for a given set of tests is reflected by the analytical results of field and laboratory duplicates, and is influenced by both field sampling and laboratory techniques. All field duplicates were submitted blind (i.e., not marked as a duplicate sample) to the analytical laboratory. Field duplicate samples are processed and analyzed by the same laboratory. Laboratory precision is much simpler to quantitate, while field precision is unique to each site and sampling matrix.

Field and laboratory precision is expressed as relative percent difference (RPD), where:

$$RPD = \frac{|X1 - X2|}{(X1 + X2)/2} X 100$$

and RPD	=	relative percent difference between duplicate results
X1 and X2	=	results of duplicate analyses
|X1 - X2|	=	absolute difference between duplicates X1 and X2

Section 5.4.1 addresses issues of comparison with field duplicate samples.

Laboratory Control Samples/Laboratory Duplicates

Laboratory precision goals were met for most of the analytes. Laboratory control samples (LCS) and laboratory duplicate sample results were utilized to assess laboratory analytical precision. All LCS and laboratory duplicate RPD values were within acceptable EPA QC limits.

Matrix Spike/Matrix Spike Duplicate

Matrix Spike/Matrix Spike Duplicate (MS/MSD) RPD values provide a means of assessing the precision of a method. A random check of MS/MSD sample results indicate that RPDs are in good agreement and within acceptable EPA QC limits for analytical data associated with the Hanford North Slope sites.

5.2.3 ACCURACY

Accuracy is a quantitative term that estimates the bias in a measurement system. Accuracy for the entire data collection activity is difficult to measure because several sources for error can exist. Errors can be introduced by any of the following:

- Sampling procedure
- Field contamination
- Sample preservation and handling
- Sample matrix
- Sample preparation
- Analytical techniques

Field sampling accuracy can be audited using field spiked samples, and laboratory accuracy can be audited using matrix spikes and surrogate recovery results.

Factors indicating the accuracy of analytical data are:

- Surrogate Spike Recoveries
- MS/MSD Recoveries
- Laboratory Control Sample Recoveries

Accuracy is measured as the percent recovery (%R) for laboratory control samples (primary QC criterion) and by the %R of the matrix spike samples (secondary QC criterion).

Surrogate Spike Recoveries

Surrogate recoveries were within acceptable limits for the majority of the samples analyzed. A review of ESE analytical data indicates that a limited number of surrogate recoveries were outside acceptable QC limits for various analyses. However, per method criteria, data are acceptable based on remaining surrogate recoveries within EPA QC limits, for each respective sample batch.

MS/MSD Recoveries

Recoveries associated with MS/MSD samples indicate that the majority of spike recoveries are within acceptable QC limits. Limited review of analytical data indicates, for various methods performed, some MS/MSD recoveries were outside acceptable EPA QC limits. Per method criteria, for each respective analysis, data are acceptable based on the remaining MS/MSD recoveries within established EPA QC limits.

Laboratory Control Sample Recoveries

Laboratory control sample (LCS) spike recoveries, per a cursory review of analytical data, indicate that LCS recoveries are within acceptable EPA QC limits for each method performed.

5.2.4 QC FREQUENCY

At selected locations, based on field observations, duplicate samples were to be collected for quality control purposes. Field quality control samples were collected at an appropriate frequency of 10% and submitted to the laboratory blind. The quality control sample frequency for the laboratory was at a rate of 5% or 1 sample per 20 samples analyzed.

5.2.5 COMPLETENESS

Completeness is defined as the percentage of valid measurements. It estimates the amount of valid data from a measurement system required to achieve a particular statistical level expected under correct, normal conditions in order to meet project data goals. The level of completeness goal for this project was defined as 90%. The level of completeness for the analytical data exceeds this goal.

5.2.6 COMPARABILITY

Comparability is a qualitative term that expresses the confidence with which one data set can be compared with another. Strict adherence to standard sample collection procedures, analytical detection limits, quantitation value units, and analytical methods assures that data from like samples and sample conditions are comparable. This comparability is independent of laboratory personnel, data reviewers, and sampling personnel. Comparability criteria are met for the project if data quality objectives described in this document are achieved, or defined to show that variations did not affect the values reported.

To assure comparability of data generated for the Hanford North Slope sites, CDM Federal utilized standard procedures, such as EPA-approved analytical methods. Utilizing such procedures and methods enable current data to be comparable to previous data sets generated with similar methods. Additionally, future data sets generated, utilizing standard methods of analysis, will be comparable to this data. Data available through the field activities allows for comparisons to established cleanup requirements (federal and state) for the North Slope sites.

5.2.7 REPRESENTATIVENESS

Representativeness is a qualitative term that expresses the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It estimates the effectiveness of the sampling scheme and indicates whether sufficient samples were collected at the appropriate sampling locations.

Samples collected at each site are representative of that respective site. Sampling procedures identified in the Work Plan for Landfill Characterization and Remediation, Site H-06-L, Hanford North Slope and Addenda (CDM Federal 1994a-g) were followed explicitly to assure representative samples were collected and sampling procedures were consistent with QC protocol.

5.3 LABORATORY QUALITY CONTROL

Laboratory QC parameters that are discussed include: analytical methods, holding times, batch method blank analysis, matrix spike/matrix spike duplicate pair analysis (MS/MSDs), and surrogate analysis. A limited QC evaluation was completed using the applicable portions of the contract laboratory program (CLP) protocols where appropriate and SW-846 criteria. Each of these QC parameters is discussed in the following subsections.

5.3.1 ANALYTICAL METHODS

Several analytical procedures were utilized to assess contaminant concentrations in a variety of environmental samples. The following methods were used for this sampling program:

Soil/Debris/Aqueous Sample Analytical Methods

Analyte	Technique (a)	Extraction/Analysis Method (b)
Volatile Organics	GC/MS	8260*
Semi-Volatile Organic	GC/MS	3540/8270
Pesticides/PCBs	GC	3510/8080
Barium, Cadmium, Chromium, Lead, Silver	ICP	3050/6010
Arsenic	AA	3050/7060
Selenium	AA	3050/7740
Mercury	CV	7471
Total Petroleum Hydrocarbons	GC/MS	9071/418.1W (c)

(a) AA = Atomic Absorption
ICP = Inductively Coupled Plasma
CV = Cold Vapor
GC = Gas Chromatography
GC/MS = Gas Chromatography/Mass Spectrometry

(b) Methods are from EPA SW-846 - Test Methods for Evaluation of Solid Wastes, 3rd Edition. 1986

(c) Washington State modified method.

*Method 8260 was performed for analytes listed in Method 8240.

5.3.2 HOLDING TIMES

Analysis and/or extraction holding time requirements are method analysis specific. Results originating from samples that are analyzed or extracted beyond their respective holding times are qualified as estimated or rejected, depending on the severity of the holding time violation and the actual level of contamination seen in the sample. However, a violation of the holding time requirements does not automatically require resampling and reanalysis for that sample.

All analyses were completed within the required holding times for all samples.

5.3.3 LABORATORY QUALITY CONTROL SAMPLES AND DATA QUALIFICATION

<u>Method Blanks</u>

SW-846 defines a method blank as an analyte free matrix to which reagents are added in the same values or proportions as used in sample processing. The method blanks should be carried through the complete sample preparation and analytical procedure. The blank is used to document any contamination resulting from the analytical process.

A limited evaluation of method blank analytical data for volatile organics indicates that low levels of methylene chloride and acetone were detected. These compounds are common laboratory contaminants and were detected at very low levels indicating a minimum impact on data quality. Other low level detects were indicated for volatile organics. These levels of volatile organics are such that data quality is not adversely affected.

BNA and Pesticide/PCB method blank data indicate the presence of bis(2-ethylhexyl)phthalate of up to 130 ppb. Bis(2-ethylhexyl)phthalate, at the levels detected, should be considered as a laboratory contaminant. Additionally, low level 4,4-DDT contamination was detected in method blanks. Levels encountered are at a very low level and will not have any effect on data quality.

Overall data quality is not affected by low level method blank contamination for the analytes of interest. No data qualification was noted.

Laboratory Control Samples (LCS)

A laboratory control sample is defined as a control sample of known composition. Aqueous and solid laboratory control samples are analyzed using the same sample preparation, reagents, and analytical methods employed for the samples received.

A limited review of LCS results indicates that LCS percent recoveries (%R) are within acceptable EPA QC limits for all analytes. RPDs for LCS are discussed in Section 5.2.2, Precision.

Matrix Spike/Matrix Spike Duplicates

MS/MSD samples are created by taking additional aliquots of the sample collected in the field for spiking at the laboratory with a known concentration of representative compounds of interest. This technique allows for the evaluations of the effect of matrix interference on the precision and accuracy of the data. Matrix interference is indicated when spike compound recovery is inhibited but not affected in a spike blank. Spike recovery inhibition or enhancement in the spike blank usually indicates laboratory/instrument analysis bias. Since an MS/MSD usually represents one sample for the batch, no qualification of the sample data is employed beyond that sample unless other QC data suggests that the performance inhibition is broad based. For this to be true, surrogate recovery would have to be similarly affected for other samples. Decisions to further qualify data based upon spike recoveries requires professional judgement. MS/MSDs were required to be analyzed at a frequency of 1 in 20 samples analyzed per sample matrix. RPDs for MS/MSDs are discussed in Section 5.2.2, Precision.

Limited review of the analytical data for MS/MSDs indicates several %R values above and below EPA QC limits for all analytes within several batches. Further assessment of the analytical data suggests that the remaining MS/MSD recoveries, with respect to each sample batch are within established EPA QC limits.

Surrogate Spikes

Surrogates are organic compounds similar in chemical nature to contaminants of interest. Known amounts are injected into each sample as in the case of the blank spike and matrix spike. Surrogate spikes allow for an evaluation of sample preparation and system accuracy with respect to each sample and chemical class. Surrogate analysis is method specific. Additionally, the use of surrogate spikes serves effectively as a standard addition procedure to verify the absence of matrix effects.

A limited review of surrogate spike recoveries (%R) indicates that most are within acceptable EPA QC limits for all analytes. Problems associated with poor surrogate recoveries include: dilution of matrix spikes, sample heterogeneity, and matrix in interference. Data quality is not affected since most of the surrogates were within acceptable QC limits and/or laboratory established (LE) QC limits.

5.4 FIELD QUALITY CONTROL

Activities performed and procedures followed in the field that can potentially affect the quality of data obtained include: sampling methods, sample handling and shipping, sample preservation, holding times, equipment decontamination, and calibration of field equipment.

All sampling was performed in accordance with the Work Plan for Landfill Characterization and Remediation, Site H-06-L, Hanford North Slope, Washington and addenda, developed by CDM Federal and approved by USACE. Additionally, sample handling, shipping, and equipment decontamination were performed in accordance with the aforementioned documents.

5.4.1 FIELD DUPLICATE SAMPLES

A field duplicate sample is a field replicate of the sample from an identical sampling point. Field duplicate results can indicate sampling technique precision. An evaluation of relative percent difference (RPD) values between positive contaminant values contained in both sample and sample duplicate is made, and the results are compared to previously accepted RPD criteria for sample collection precision for the matrix. RPD performance is highly matrix and method dependent therefore, a high degree of variability is usually indicated.

Acceptance criteria used for the aqueous field duplicate is as follows:

RPD $\leq$ 25% - Good field sampling precision
RPD $\leq$ 50% - Fair field sampling precision
RPD $\geq$ 51% - Poor field sampling precision

Acceptance criteria used for the soil field duplicate is as follows:

RPD $\leq$ 35% - Good field sampling precision
RPD $\leq$ 60% - Fair field sampling precision
RPD $\geq$ 61% - Poor field sampling precision

Field duplicate samples results, indicating significant dilution or variation in detection limits will not be assessed. RPD values for field duplicate samples are summarized in Table 5-2. RPD values were within acceptable agreement for the majority of field duplicate samples completed.

RPD values for duplicate soil samples 94H06L(E)-A14-01-001 and 94H06L(E)-A14-02-001 were calculated at 80 for DDD and 70 for DDT. As assigned by the aforementioned criteria for soil RPDs, the RPD values are considered poor. Wide variations in RPD values, with

TABLE 5-2

RPDs FOR FIELD DUPLICATES BY SITE

Analyte	UNITS	H-06-L											
		94H06L(W)-A19-03-005	94H06L(W)-A19-04-005	RPD	94H06L(E)-A14-01-001	94H06L(E)-A14-02-001	RPD	94H06L(W)-BG2-01-002	94H06L(W)-BG2-02-002	RPD	94H06L(E)-A01-02-005	94H06L(E)-A01-03-005	RPD
ARSENIC	mg/kg	3.75	3.52	6%	6.88	6.98	1%	4.71	5.11	8%	5.42	5.54	2%
BARIUM	mg/kg	100	107	7%	105.00	111.00	6%	114.00	117.00	3%	125.00	107.00	16%
CHROMIUM	mg/kg	7.45	5.56	29%	14.10	14.90	6%	7.69	7.47	3%	14.90	16.00	7%
DDD	µg/kg	--	--	--	3790.00	1630.00	80%	--	--	--	269000.00	276000.00	3%
DDE	µg/kg	74	85.5	14%	2130.00	1870.00	13%	--	--	--	22100.00	28000.00	24%
DDT	µg/kg	64.6	78.6	20%	11600.00	5600.00	70%	1.66	1.47	12%	695000.00	611000.00	13%
LEAD	mg/kg	--	--	--	--	--	--	--	--	--	24.50	23.60	4%
ETHYL NAPTHAL	µg/kg	--	--	--	--	--	--	--	--	--	3800.00	2900.00	27%
PHENANTHRENE	µg/kg	--	--	--	--	--	-	-	--	--	2700.00	2500.00	8%
PYRENE	µg/kg			--	--	--	--	--	--	--	750.00	850.00	13%
ALDRIN	µg/kg		--	--	--	--	--		--	--	52.70	54.90	4%
DIELDRIN	µg/kg	--	--	--	--	--	--	--	--	--	1980.00	2630.00	28%
ACETONE	µg/kg	--	--	--	--	--	--	--	--	--	--	--	--

Analyte	Units	H-83-L			H-83-C		
		94H83L-A06-02-002	94H83L-A06-03-002	RPD	94H83C-BKG-01-002	94H83C-BKG-02-001	RPD
ARSENIC	mg/kg	1.16	1.00	15%	2.76	2.56	8%
BARIUM	mg/kg	71.20	77.60	9%	93.00	96.10	3%
CHROMIUM	mg/kg	4.71	5.16	9%	12.50	12.20	2%
DDD	µg/kg	--	--	--	--	--	--
DDE	µg/kg	--	--	--	--	--	--
DDT	µg/kg	--	--	--	--	--	--
LEAD	mg/kg	--	--	--	--	--	--
ETHYL NAPTHAL	µg/kg	--	--	--	--	--	--
PHENANTHRENE	µg/kg	--	--	--	--	--	--
PYRENE	µg/kg	--	--	--	--	--	--
ALDRIN	µg/kg	--	--	--	--	--	--
DIELDRIN	µg/kg	--	--	--	--	--	--
ACETONE	µg/kg	17.00	24.00	34%	--	--	--

respect to soil samples, can be expected. These variations can be attributed to the heterogeneous nature of the samples.

5.4.2 TRIP BLANKS AND RINSATES

Trip blank analytical data indicates that no target analytes were present within the trip blank samples.

Rinsate analytical data indicates that no target analytes were present within rinsate samples, with the exception of bis(2-ethylhexyl) phthalate detected at 2.2 µg/l within rinsate sample 94H06L(W)-A05-01-EB1. Detection of this analyte is likely due to laboratory contamination since bis(2-ethylhexyl) phthalate is considered a common laboratory contaminant.

5.4.3 DEVIATIONS FROM FIELD PROCEDURES

Methods and procedures employed in the field during the Hanford North Slope Landfill Characterization and Remediation followed the Work Plan, Landfill Characterization and Remediation, Site H-06-L, Hanford North Slope, Washington and subsequent addenda (CDM Federal 1994a-g). Significant changes in technical approach (e.g., the change from complete waste excavation to exploratory trenching) were documented and approved in advance in the site specific work plan addenda. Some other, typically minor, changes or deviations to procedures were made in the field with the concurrence of USACE site representatives. A summary of these deviations is provided in Table 5-3.

5.5 DATA USABILITY SUMMARY

Based on a limited review of analytical data generated by Environmental Science and Engineering, Inc., these data meet the basic requirements outlined in the Work Plan for the Hanford North Slope, Site H-06-L and Addenda (CDM Federal 1994a-g). In order to develop a more definitive description of data usability, a more extensive review would be required. Overall, the data should be considered acceptable for their intended use.

TABLE 5-3

DEVIATIONS FROM FIELD PROCEDURES

Document and Section in Which Requirement is Stated	Requirement	Deviation
Work Plan, 4.1.2; QAPjP 6.1	USACE Ordnance Expert was to inspect each area prior to excavation.	Based on historical information and inspection of wastes from numerous excavations at the H-06-L site, USACE Ordnance Experts waived this requirement for remaining North Slope work.
WP 4.1.3	CDM Federal was to provide equipment and operators for radiation screening.	Radiation screening equipment was provided by Battelle Pacific Northwest Laboratories and operated by USACE personnel. Additionally, the CDM Federal subcontract laboratory, ESE, conducted radiation screening of all samples received from the North Slope investigations.
WP 4.2; QAPjP 6.1	Geophysical investigations were to be conducted using EM, MAG and Ground-penetrating radar (GPR) equipment.	GPR equipment was not utilized. Power requirements and vehicle restrictions made use of the equipment impractical. Satisfactory results were achieved using EM and MAG equipment alone.
WP 4.3	Anticipated maximum trench dimensions were 3 ft wide, 20 ft long, and 11 ft deep.	Actual trench dimensions varied widely and frequently exceeded these anticipated maximums. Trenches at the H-06-L Site were excavated until all buried wastes had been removed. Subsequent investigations at other North Slope sites utilized trenches of approximately 5-10 ft wide and as deep and long as necessary to reach undisturbed/uncontaminated materials.
WP 4.4.1	At least one sample was to be collected from each anomaly excavated.	All sampling was done at the direction of the USACE. After initial excavations yielded wastes such as coils of barbed wire, construction debris, and other non-hazardous materials, the USACE, DOE and regulatory agencies concurred that sampling would not be required at each anomaly.
WP 4.4.6; QAPjP 11.0	Extra sample volume requirements were stated for MS/MSD samples.	ESE indicated that extra sample volume would not be required for these samples. Samples used for MS/MSD analyses were selected by the laboratory.

TABLE 5-3 (continued)

DEVIATIONS FROM FIELD PROCEDURES

Document and Section in Which Requirement is Stated	Requirement	Deviation
WP 4.4.7	Specific sample container requirements were stated.	Analytical laboratory indicated that more than one analytical method could be run on sample from a single container. Sample container quantities were reduced while minimum specifications for container quality were not.
QAPjP 11.0	Minimum frequencies for QA/QC samples were given per site.	At the direction of the USACE, stated QA/QC sample frequencies were met per mobilization or field event (i.e., one QA or QC sample may have been collected to meet the requirements for more than one site.

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6.0 CONCLUSIONS

6.1 SUMMARY OF FINDINGS

The investigation and cleanup of the thirteen Hanford North Slope sites were completed on September 30, 1994. Geophysical surveys and verification of previously identified anomalies were conducted at all thirteen of the suspected landfill sites. Areas of anomalous response, indicative of buried wastes or other non-native materials, were present at ten of the thirteen sites. Anomalies were excavated or evaluated through exploratory trenching to determine if hazardous or contaminated materials were present. The approximate total volume of excavated materials was 17,892 cy. Of this volume, less than 6% was determined to be hazardous or contaminated. Wastes which were removed from the sites for offsite disposal included approximately 600 cy of DDT contaminated soil and debris, approximately 450 cy of soil and debris contaminated with petroleum hydrocarbons, and less than 1 cy each of paint-contaminated wastes, and tar-like wastes. Disposition of these waste materials are discussed in Section 6.2.

A summary of analytes detected in background samples is presented in Appendix C along with the calculated mean background concentrations. Appendix D consists of a summary of the laboratory analytical data for all soil, debris, and aqueous (rinsate, wastewater, and trip blank) samples for analytes which were detected. Included for reference on the table of soil and debris sample results are the cleanup levels for detected analytes as established under the Washington State Model Toxics Control Act (MTCA) (WAC 173-340). Also included are mean concentration values for metals which were detected in background soil samples collected at several of the North Slope sites.

As indicated on the table in Appendix D, organic and inorganic analytes were detected at concentrations exceeding MTCA cleanup levels in several samples collected at the North Slope sites. Without exception, every sample in which an analyte exceeded MTCA cleanup levels represented material which was eventually transported and disposed offsite. The MTCA cleanup levels most commonly exceeded in North Slope site samples were TPH, DDT, DDE, and DDD. Soils contaminated with these organic compounds also comprise nearly all of the waste materials which required offsite disposal. Other analytes which exceeded their respective MTCA cleanup levels were the pesticides chlordane and dieldrin (in samples containing higher concentrations of DDD, DDE, and DDT), lead (in a paint waste sample and a sample of a tar-like waste), and several PAHs (in the sample of tar-like waste). Two samples (a petroleum-contaminated and a paint waste sample) contained lead concentrations in excess of 1,000 mg/kg

Background samples were collected and analyzed to provide a baseline to which concentrations of naturally occurring analytes (metals) can be compared. An analysis of background data is presented in Section 4.4. The only three metals detected in background samples were arsenic, barium, and chromium. In site and waste characterization samples, these metals were within three times the mean background concentration except for one petroleum hydrocarbon-contaminated sample (94H06L (W)-A16-01-007) which contained 25 mg/kg chromium, three times the mean background concentration of 8.1 mg/kg. At this concentration, chromium was present at significantly less than the MTCA cleanup level of 100 mg/kg.

Lead was the only metal frequently detected at concentrations greater than three times the detection limit. Other than the two cases described above where lead exceeded the MTCA cleanup level of 250 mg/kg, lead was typically present at levels below 100 mg/kg. Most occurrences of detectable lead were in samples of petroleum hydrocarbon-contaminated soil and debris.

6.2 DISPOSITION OF HAZARDOUS AND CONTAMINATED MATERIALS

An inventory of segregated waste materials and investigation derived wastes generated during the North Slope characterization and remediation is presented in Appendix E. Included in this inventory is a description of the disposition of all materials removed from the North Slope. CDM Federal's initial scope of work required segregation of these materials for later determination of proper offsite treatment and or disposal. This scope was later modified to include loading of the DDT-contaminated soils and debris from the H-06-L Site onto transport trucks provided by others. All waste transportation and disposal was handled under separate contract.

All hazardous or contaminated wastes encountered during the Hanford North Slope characterization and remediation were shipped offsite for disposal by September 30, 1994. Waste materials were sent to several different locations depending on the hazardous substances or contamination present. Uncontainerized DDT-contaminated soils (approximately 600 cy) were sent to the Chemical Waste Management Facility in Arlington, Oregon, for disposal. Drummed hazardous materials (i.e., small quantities of DDT-contaminated soil, lead-based paint waste, tar-like wastes with elevated lead concentrations) were shipped to the WHC 616 Facility on the Hanford Site or to the Hanford 100 N Pad for further characterization. Petroleum-contaminated soil from the PSN 90 Site, which contained trace levels of 2,4-dinitrotoluene, was shipped to the Chemical Waste Management Facility in Arlington, Oregon, for disposal. Other petroleum-contaminated soils were disposed of at the New Waste Disposal Facility in Pasco, Washington.

7.0 REFERENCES

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CDM Federal/Harding Lawson Associates Site name and Anomaly Cross-Reference

Certain discrepancies exist in site names and anomaly numbering between CDM Federal and Harding Lawson Associates (HLA) reports. A cross-reference is provided below to minimize confusion.

Site H-06-L - Anomaly cross-reference

HLA Report	CDM Federal
H-1	A-23
H-2	A-24
H-3	A-25
H-4	A-16
H-5	A-17
H-6	A-18

Site Bridge Overlook #1 - No anomaly cross-reference required. HLA report site name is Bridge Overview-2

Site Bridge Overlook #2 - Anomaly cross-reference:

HLA Report	CDM Federal
A-1	A-2
A-2	A-1
A-3	A-3
A-4	A-4

HLA report site name is Bridge Overview-1

No further site name or anomaly cross-reference required for all other sites.

Results of Geophysical Survey H-06-L Landfill Hanford North Slope Richland, Washington

Prepared for

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CONTENTS

1.0 INTRODUCTION 1

2.0 GEOPHYSICAL METHODS 2

3.0 SITE CHARACTERISTICS 3

4.0 FIELD PROCEDURES 4

4.1 WHC Anomaly Verification Survey 4
4.2 HLA Horizontal Control Installation 4
4.3 HLA Geophysical Survey 4
4.3.1 Electromagnetic (EM) Profiling Survey 4
4.3.2 Magnetic Gradient (MAG) Survey 5
4.3.3 HLA Anomaly Verification and Detailing Survey 5
4.4 HLA Site Map Preparation 5

5.0 DATA ANALYSIS AND INTERPRETATION 7

5.1 Field Data Reduction and Interpretation 7
5.2 Office Data Reduction and Interpretation 7
5.3 Criteria Used to Estimate the Location of Landfill Cells and Buried Objects 7

0 RESULTS 9

6.1 WHC Anomaly Verification Survey 9
6.2 HLA Geophysical Survey 9

TABLES

1 HLA Geophysical Anomaly Locations and Characteristics, H-06-L Landfill

PLATES

1 Site Location and Survey Area Maps
2 Geophysical Survey Coverage and Results Map
3 Magnetic Gradient Contour Map
4 EM In-Phase Signal Contour Map
5 EM Terrain Conductivity Contour Map
6 Magnetic Gradient Color-Shaded Map

APPENDIX

GEOPHYSICAL METHODS AND EQUIPMENT

DISTRIBUTION

1.0 INTRODUCTION

This report presents the results of Harding Lawson Associates, (HLA) surface geophysical investigation at the H-06-L landfill site located on the North Slope of the Hanford Reservation near Richland, Washington. The purpose of the investigation was to locate and delineate landfill cells in support of CDM Federal Programs Corporation's (CDM) site characterization activities.

HLA's investigation consisted of two separate work tasks that were described in CDM's statement of work (SOW) dated April 14, 1994:

1) a survey to verify the locations of 37 geophysical anomalies identified during a previous geophysical investigation conducted by the Westinghouse Hanford Company (WHC) in 1991.

a survey of adjacent previously uninvestigated areas to locate additional landfill cells, if present.

The field work was performed on April 18 through 25, 1994 by HLA geophysicist Roark W. Smith of HLA's Novato, California, office, and Scott R. Yancey, of HLA's Seattle, Washington, office. Guidance and logistical support were provided by Mr. Paul A. Karas of CDM.

This document was prepared for the sole use of CDM Federal Programs Corporation and its authorized subcontractors. No other party should rely on the information contained herein without prior written consent of HLA.

2.0 GEOPHYSICAL METHODS

HLA used two geophysical methods during this investigation: electromagnetics (EM) and magnetics (MAG). The EM instruments used were a Geonics Model EM31-D terrain conductivity meter, and a Fisher Model TW-6 M-Scope. The EM31-D was used to locate landfill cells by detecting conductivity changes associated with landfill materials. The M-Scope was used to detect shallowly buried metal typically found in landfills. The MAG instrument was an EG&G, Geometrics Model G-856X magnetometer, which was used to detect ferrous metal debris. Because of vehicle access restrictions, ground penetrating radar was not used. A more detailed description of the methods and equipment used is presented in the Appendix.

3.0 SITE CHARACTERISTICS

Overall, the H-06-L landfill investigation area, which includes both the HLA and WHC survey areas, measures approximately 2,600 feet east-west by 500 feet north-south (Plates 1 and 2). The terrain is generally flat and sparsely vegetated. The investigation area is divided into two sites by an 80-foot-wide north-south trending corridor. The corridor contains a concrete-lined drainage ditch, called a wasteway, and two barbed-wire fences, which greatly affected the geophysical measurements.

In 1991, the Westinghouse Hanford Company (WHC) surveyed a 300- by 300-foot area east of the wasteway corridor, and an approximately 1,900- by 400-foot area west of the corridor. The sites are designated H-06-L East, and H-06-L West. For the current investigation, HLA enlarged and combined the two sites by gridding and surveying a 100- by 100-foot area north of H-06-L East, a 100- by 1,900-foot area south of H-06-L West, and an approximately 400- by 500-foot area between the two previously surveyed areas (Plate 1).

4.0 FIELD PROCEDURES

Prior to each day's field work, a safety briefing was given by Mr. Karas, and operational checks were made on all functional components of the two geophysical systems. Each system was tuned to local conditions according to the manufacturers' operations manuals. A calibration point for the EM system and a base station location for the MAG system were established in an area of native soil identified during a walkaround survey. These points were occupied at the beginning and end of each day's surveying for instrument calibration and tuning. The background calibration values and tuning signal strengths were recorded in the geophysicist's field logbook.

The field work was conducted in four stages:

1) WHC Anomaly Verification Survey

) HLA Horizontal Control Installation

3) HLA Geophysical Survey

4) HLA Site Map Preparation.

4.1 WHC Anomaly Verification Survey.

The HLA geophysicist hand-carried the EM31-D and M-Scope instruments to each anomaly location as shown on a map provided by CDM. In general, the 37 anomalies previously identified by WHC were marked in the field by wooden stakes, although many stakes had fallen and were not in their original position.

At each anomaly location, the HLA geophysicist first used the M-Scope to delineate areas of shallowly buried metal. The EM31-D was then used to delineate areas of anomalous conductivity indicative of more deeply buried metallic and non-metallic landfill materials. For the verification survey, the geophysical responses were monitored by bserving the instruments' meters; no data ere recorded. Areas of anomalous response were outlined on the ground with orange spray paint. Before leaving the site, the HLA geophysicist accompanied Mr. Karas on an inspection of the verified anomaly locations.

4.2 HLA Horizontal Control Installation

A control grid was installed for the HLA survey areas by using a fiberglass tape measure and survey markers remaining from the WHC investigation to establish an east-west baseline along the southern boundary of the H-06-L West survey area. The baseline was marked with wooden lath every 200 feet and PVC pin flags every 20 feet. Using the tape measure and backsighting techniques, the baseline was extended across the wasteway corridor and into the H-06-L East site, thus joining sites H-06-L East and H-06-L West with a common grid system.

By using the tape measure to form 30-, 40-, 50-foot right triangles, north-south survey transects perpendicular to the baseline and spaced 40 feet apart were installed. In general, the control grid consisted of north-south rows of PVC pin flags spaced 40 feet apart. The pin flags were removed after the geophysical survey was completed, but the wooden laths along the baseline were left in place so the HLA control grid could be reestablished.

4.3 HLA Geophysical Survey

4.3.1 Electromagnetic (EM) Profiling Survey

EM profiling data were obtained by hand-carrying the portable EM system along north-south survey transects spaced 20-feet apart. The EM profiles were positioned by interpolating transect locations 10 feet on either side of the rows of pin flags. Two components of the EM signal (in-phase and terrain conductivity) were digitally recorded at 1-second intervals by the data logging system. Additionally, the two components were recorded as continuous analog traces on a two-channel chart recorder. Survey transect number and instrument setting and scaling information were written on the analog records. Stationing along each transect was marked by inserting a special flagging record into the digital datafile and by scribing the analog chart record at 20-foot intervals as a pin flag was passed. Analog EM profiles, without digital records, were also obtained along east-west reconnaissance transects north of the HLA survey grids (Plate 2).

EM data were periodically transferred to a laptop computer and copied onto backup floppy disks. Each evening the analog chart records were reviewed to check that proper line number and stationing information had been recorded. Also recorded on the analog records was the name of the corresponding digital datafile. A total of 21,180 line feet of EM profiling data were collected for this investigation.

4.3.2 Magnetic Gradient (MAG) Survey

The MAG system used for this survey consisted of two magnetometers. One instrument was used as a base station and was positioned in a remote area of the site to monitor naturally occurring variations in the earth's magnetic field. The base station data were digitally recorded at 30-second intervals and transferred to a laptop computer after each field day.

A second magnetometer was used to perform the gradient survey. The gradient survey was conducted along north-south transects spaced 20 feet apart. The MAG transects were offset 10 feet from the EM survey transects, and located along the rows of pin flags and midway between the rows. This offset procedure produced a geophysical investigation with a 10-foot survey transect spacing.

Magnetic measurements were made by carrying the instrument along the survey transects and stopping to take readings at 10-foot intervals marked by the pin flags and at midpoints interpolated between the flags. The operator provided line and station spacing information, and the instrument automatically stored in memory the total magnetic field readings obtained at each measurement station.

At the beginning of each day's surveying, magnetic measurements were first obtained along the baseline. As the MAG survey progressed, the baseline stations were reoccupied so time-varying magnetic noise (diurnal drift) could be monitored. This procedure was performed as a backup to the automatically recorded base station data. In addition, at selected stations, several successive magnetic strength readings were taken to validate instrument sensitivity and reproducibility and to check for short-period magnetic noise (micropulsations or sunspot activity).

Magnetic gradient data were periodically transferred in the field to a laptop computer and copied onto backup floppy disks. Each evening the gradient data were output to a line printer and the printout was annotated with transect number, stationing, and date.

A total of 21,180 linear feet of survey transect were traversed for the MAG survey, and a total of 4,720 magnetic measurements (2 measurements at each station) were obtained for this investigation.

4.3.3 HLA Anomaly Verification and Detailing Survey

After all data geophysical data were collected and reviewed, a preliminary anomaly location map was prepared. The geophysicist returned to the field and the anomalies were resurveyed along supplemental survey transects for verification and to finalize their locations and dimensions. This procedure helped pinpoint buried objects not located directly along the survey transects and removed any positioning errors caused by the interpolation of transect and station locations. The anomaly locations and dimensions were marked on the ground with orange spray paint and labeled PVC pin flags.

4.4 HLA Site Map Preparation

A site features map was prepared by walking the survey transects and plotting the locations of notable surface features onto grid paper. The site features map served as a basemap on which our finalized interpretation is presented. In addition, the map shows significant surface features that help reference the geophysical coverage to the survey area. The map also shows other site features, such as metal fences, that affected the geophysical measurements. The site map was digitized for presentation in this report.

5.0 DATA ANALYSIS AND INTERPRETATION

5.1 Field Data Reduction and Interpretation

EM chart records were inspected each evening for anomalous responses indicative of buried metal or other landfill materials. The printouts of the digital MAG gradient data were also inspected for anomalous readings indicative of buried ferrous metal. A diurnal drift curve was prepared from the MAG base station data using the software program GRAPHER. This curve was inspected for any large naturally occurring magnetic variations that could produce false anomalies and necessitate resurveying of selected MAG transects.

The locations of anomalous EM and MAG responses were plotted on the hand-drawn site features map. A copy of this map was provided to Mr. Karas to help direct CDM's ongoing excavation and trenching program.

5.2 Office Data Reduction and Interpretation

Upon the geophysicist's return to HLA's Novato, California, office, the digital EM data were output to a printer for checking and editing to ensure that proper station markers were in place. The EM data files were then processed using an HLA in-house software program that separates the terrain conductivity and in-phase data into different data files and assigns X-Y locations to each value. MAG data were reduced using the Mag-Pac software program distributed by EG&G Geometrics. This program performs the gradient calculation and assigns X-Y locations for each station.

Computer contour maps of the magnetic gradient (Plate 3), EM in-phase signal (Plate 4), and EM terrain conductivity (Plate 5) were generated using the Geosoft Mapping System, distributed by GEOSOFT, Inc., Toronto, Canada. GEOSOFT was also used to produce a color-shaded magnetic gradient map (Plate 6). Graphics products presented in this report were generated using AutoCad software.

5.3 Criteria Used to Estimate the Location of Landfill Cells and Buried Objects

EM anomalies associated with burial sites are usually evaluated in terms of increases in terrain conductivity over an established background value and/or changes in the in-phase signal. Background EM conductivity data obtained in areas of native-appearing soil at the H-06-L site were approximately 25 millihmos per meter (mmhos/m). The EM in-phase signal generally ranged between +50 and -50 millivolts.

The presence of subsurface disposal areas can be inferred from localized EM readings above or below background values, indicating the presence of subsurface features different from those in surrounding unaffected areas. A rapid change in in-phase response is an indicator of nearby metal. The amount of variation from background readings can provide an indication of the amount of landfill material present and/or its depth of burial.

Magnetic data show that the background total field strength is approximately 55,600 gammas, and the background magnetic gradient ranges from 10 to 20 gammas per foot. These are somewhat noisy and high background values and are probably due to iron-bearing minerals in the volcanic rock common in the Hanford area. The magnetic noise is especially apparent on the color-shaded map (Plate 6). The presence of buried ferrous metal can be inferred from localized readings above these background values. As with EM data, the amount of variation from background can provide an indication of the amount of ferrous metal present and/or its depth of burial.

The extent of disposal areas is determined by correlating areas of anomalous geophysical response between adjacent survey transects.

Anomalous responses occurring in the same area along several adjacent transects are indicative of larger landfill cells, while anomalous responses that occur along a single transect without corresponding anomalies on adjacent transects are indicative of more localized debris.

Computer contour maps are often helpful when inspecting large data sets for indications of disposal areas. Widespread EM and MAG anomalies indicative of large landfill cells are generally apparent as areas of tightly-bunched contours. Color-shaded maps can further emphasize anomalous areas; however, because averaging and smoothing of the data occur during computer processing, the resulting contour maps often do not show the actual distribution of anomalous measurements, especially for more localized anomalies or along sharp boundaries between anomalous and background responses. A review of the analog EM chart records and an inspection of the gradient measurements on the MAG data printout is often more helpful when locating smaller concentrations of subsurface debris and delineating the limits of larger landfill cells more exactly.

6.0 RESULTS

6.1 WHC Anomaly Verification Survey

All of the 37 WHC anomalies indicated on the maps provided by CDM were verified by HLA. In general, the WHC anomaly locations corresponded to the mapped locations and to the placement of wooden stakes in the field. EM31-D and M-Scope scans indicated the presence of abundant shallow metal debris in the shallow (upper 5 feet or less) subsurface at most anomaly locations. EM31-D scans also indicated the presence of more deeply buried metallic and non-metallic debris.

Anomaly dimensions determined by HLA occasionally differed slightly from those indicated by WHC. The differences were insignificant and are attributed to HLA's free-walking verification survey procedure which was not confined to pre-established survey transects. By scanning along numerous crossing and intermediate traverses, the HLA geophysicist was able to more precisely delineate localized metal debris that strongly influenced anomaly dimensions.

6.2 HLA Geophysical Survey

Six additional anomalies, designated H-1 through H-6, were identified by HLA. The anomaly locations and approximate dimensions are shown on Plate 2. The magnetic gradient contour map is shown on Plate 3. The EM conductivity and EM in-phase contour maps are shown on Plates 4 and 5, respectively. Also presented is a color shaded map of the MAG gradient data (Plate 6). Table 1 summarizes the anomaly locations and characteristics.

The most pronounced geophysical anomalies, as shown on the contour maps (Plates 3, 4, and 5), are found along the wasteway corridor. The anomalous responses are caused by the barbed-wire fences and the metal reinforcement in the concrete wasteway lining; they have been discounted during the interpretation process. It is recognized that landfill material within thirty feet of the corridor probably would not be detected. For this reason, the anomalous readings associated with this corridor have been removed from the color display shown on Plate 6 so that the anomalies indicative of subsurface disposal will be more apparent.

In general, the geophysical anomalies identified by HLA correspond to shallow topographic depressions indicative of backfilled disposal pits and trenches containing metal. The most significant anomaly is at Site H-06-L East, where an approximately 200-foot long extension of a previously identified WHC anomaly was mapped (Plate 2). The remaining five HLA anomalies are more localized features indicative of smaller trenches or pits. A more detailed discussion of anomaly characteristics follows.

Anomaly H-1 is in the previously surveyed area of the H-06-L West site. The anomaly was identified during a reconnaissance EM traverse obtained while returning to the field vehicle after completion of EM surveying at the West site. The anomaly is localized feature associated with a linear topographic depression approximately 130 feet north of HLA grid coordinate 1+00N, 5+60E (Plate 2). Anomaly H-1 is characterized by EM in-phase response of approximately -500 millivolts (mv) indicative of shallowly buried metal. This anomaly probably represents the western portion of a disposal trench associated with a previously identified WHC anomaly. Because anomaly H-1 is not within the HLA survey area, no digital EM or MAG data were collected and the anomaly is not shown on the computer contour maps.

Anomalies H-2 and H-3 are in the H-06-L West site, near HLA grid coordinates 0+90N, 5+80E (Plate 2). These anomalies are associated with two shallow topographic depressions measuring approximately 15 feet by 40 feet that appear to represent a pair of disposal pits. The anomalies are characterized by EM in-phase signals +/- 150 mv and MAG gradients of from 20 to 50 gammas per foot. These are relatively small variations from background measurements and, considering the absence of an associated EM conductivity anomaly, are indicative a smaller amounts of more deeply buried metal and possibly non-metallic debris. The anomalous responses at H-3 were detected over a 40- by 70-foot area indicating subsurface disposal is more widespread than is suggested by the topographic depressions.

Anomaly H-4 is a localized feature in the H-06-L East area near HLA grid coordinate 4+00N, 24+30E (Plate 2). This anomaly is associated with a shallow topographic depression measuring approximately 10 feet by 30 feet. Anomaly H-4 is characterized by EM in-phase signals of -500 mv and MAG gradients from 10 to 20 gammas per foot. The MAG gradients are too small and localized to appear on the contour and color-shaded maps. The moderate EM in-phase variations from background and the absence of a high gradient MAG anomaly are indicative of non-ferrous metal, or smaller masses of elongated ferrous metal such as sheeting, wire, or small diameter cable.

Anomaly H-5 is the northern extension of an anomaly previously identified WHC. The anomaly is in the H-06-L East site, along survey transect 25+30E (Plate 2). It is associated with a rectangular area of subsided ground and stressed vegetation, and appears to represent a large burial trench. The portion of this area within the HLA survey area measures approximately 15 feet east-west by 200 feet north-south. Anomaly H-5 is characterized by MAG gradients of 50 to 900 gammas per foot (Plate 3), and EM in-phase responses of from +100 to -500 mv (Plate 4). These are large variations from background and are indicative of substantial amounts of buried metal.

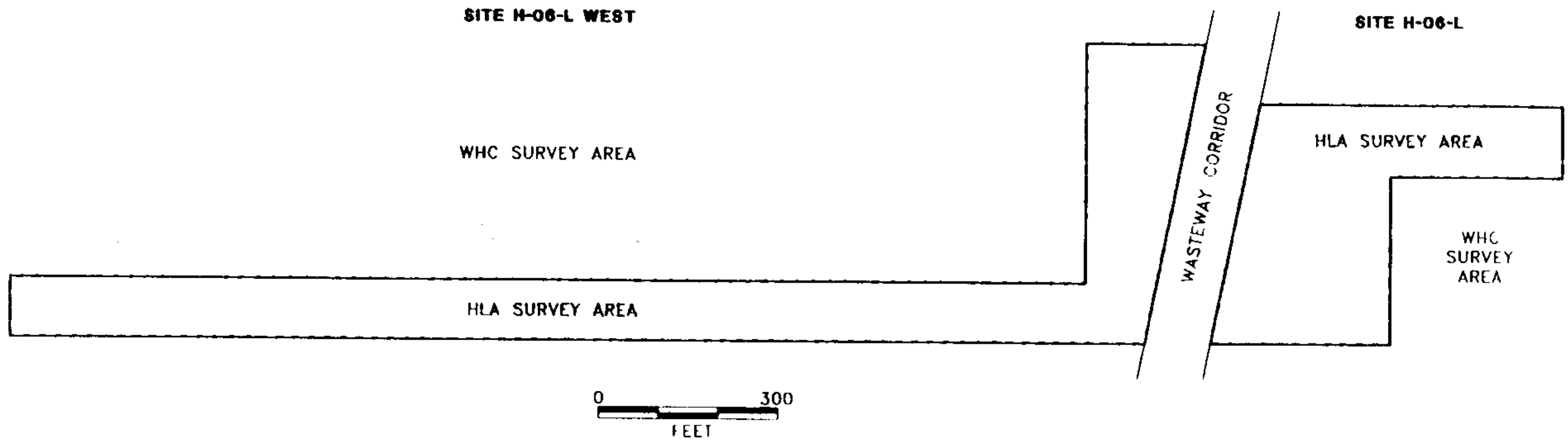
Anomaly H-6 is a localized feature within the wasteway corridor near grid coordinate 1+60N, 20+10E. This anomaly is characterized by an EM in-phase variation of -200 mv without associated changes in EM conductivity or MAG gradient. This type of response is indicative of a smaller and/or more deeply buried non ferrous metal object(s) or a localized change in soil properties.

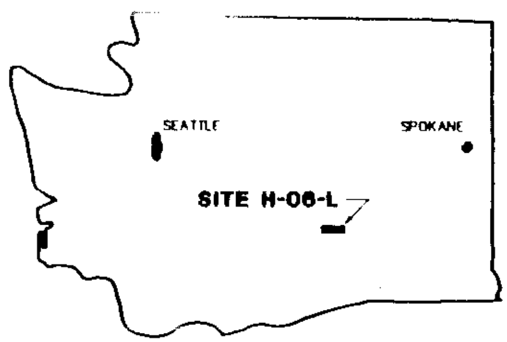
TABLES

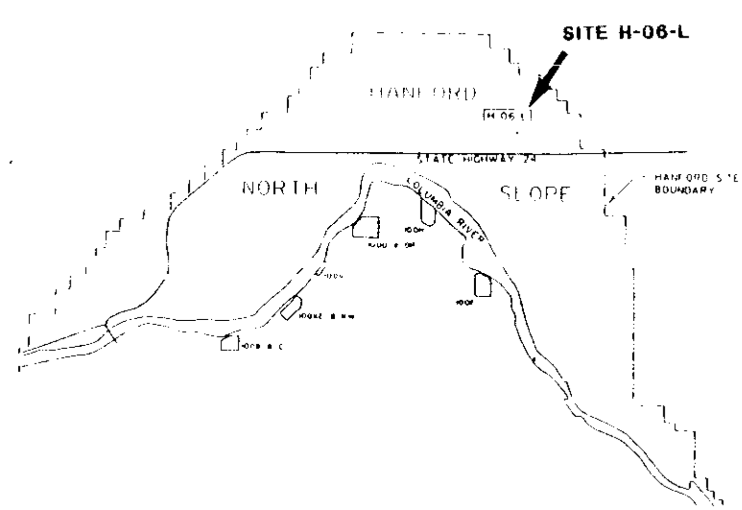
Table 1. Geophysical Anomaly Locations and Characteristics, H-06-L Landfill
Hanford North Slope
Richland, Washington

Anomaly Designation	Survey Grid Coordinates (ft)	Anomaly Dimension (ft)	Approx. Depth of Burial (ft)	Interpretation of Subsurface Characteristics
H-1	N2+30, E5+60 (not in HLA survey grid)	20 x 25	< 5	Localized small metal debris
H-2	N0+90, E5+60	15 x 50	<5	Localized shallow small metal debris with deeper metal and non-metal debris
H-3	N0+50, E5+60	40 x 70	<5	Localized shallow small metal debris with deeper metal and non-metal debris
H-4	N4+00, E24+30	10 x 30	<5	Localized small metal debris, possibly non-ferrous
H-5	N3+50,	15 x 200	<5	Large amounts on metal and non-metal debris in burial trench
H-6	N1+60, E20+10	10 x 10	>5	Localized non-ferrous metal object(s) or change in soil properties

PLATES







N

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Environmental Services

Site Location and Survey Area Maps
Site H-06-L, East and West
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969.2	RWS	5/94	

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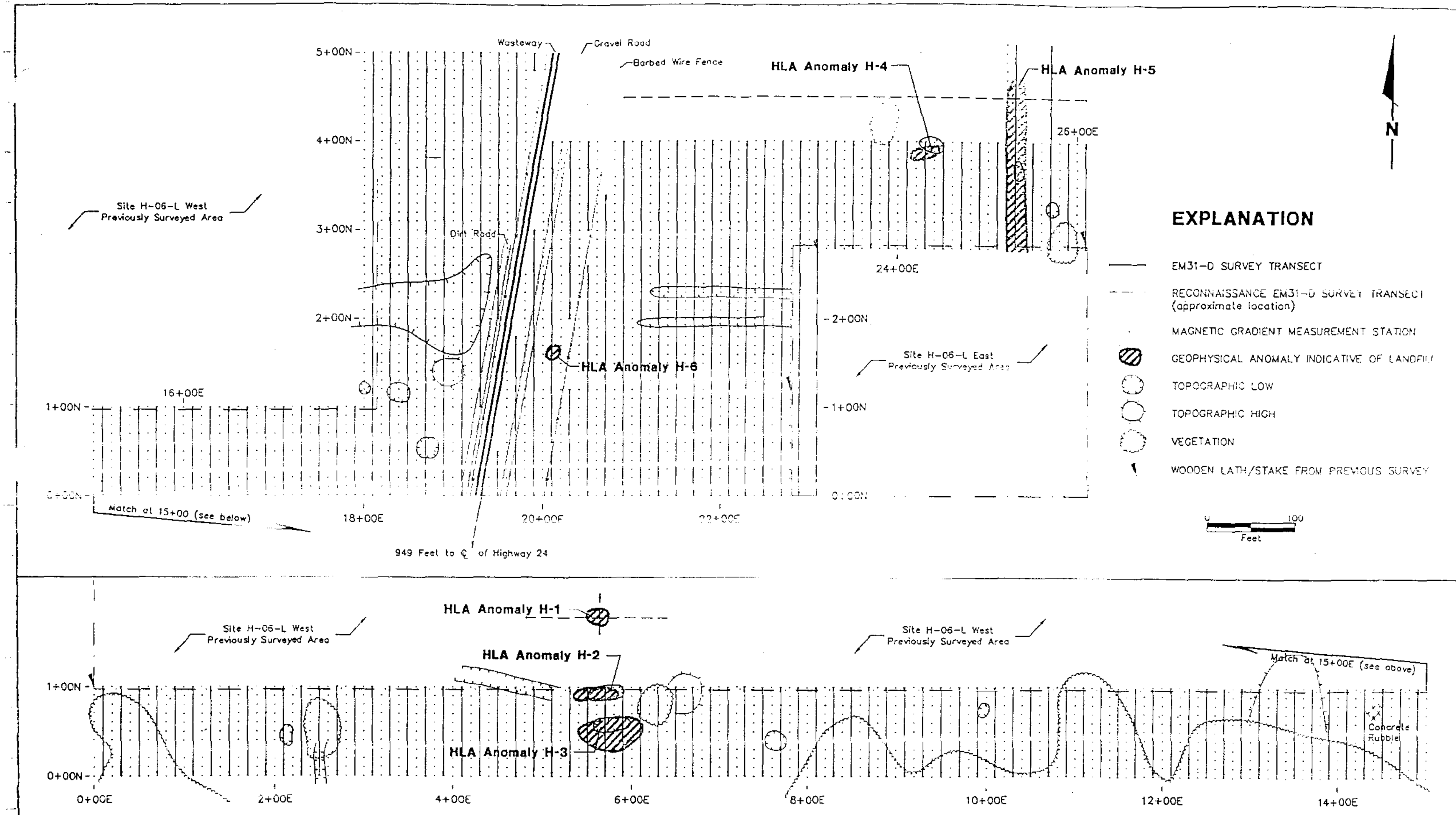

0 100
Feet

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Geophysical Survey Coverage and Results
Site H-06-L, East and West
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969,2	RWS	6/94	

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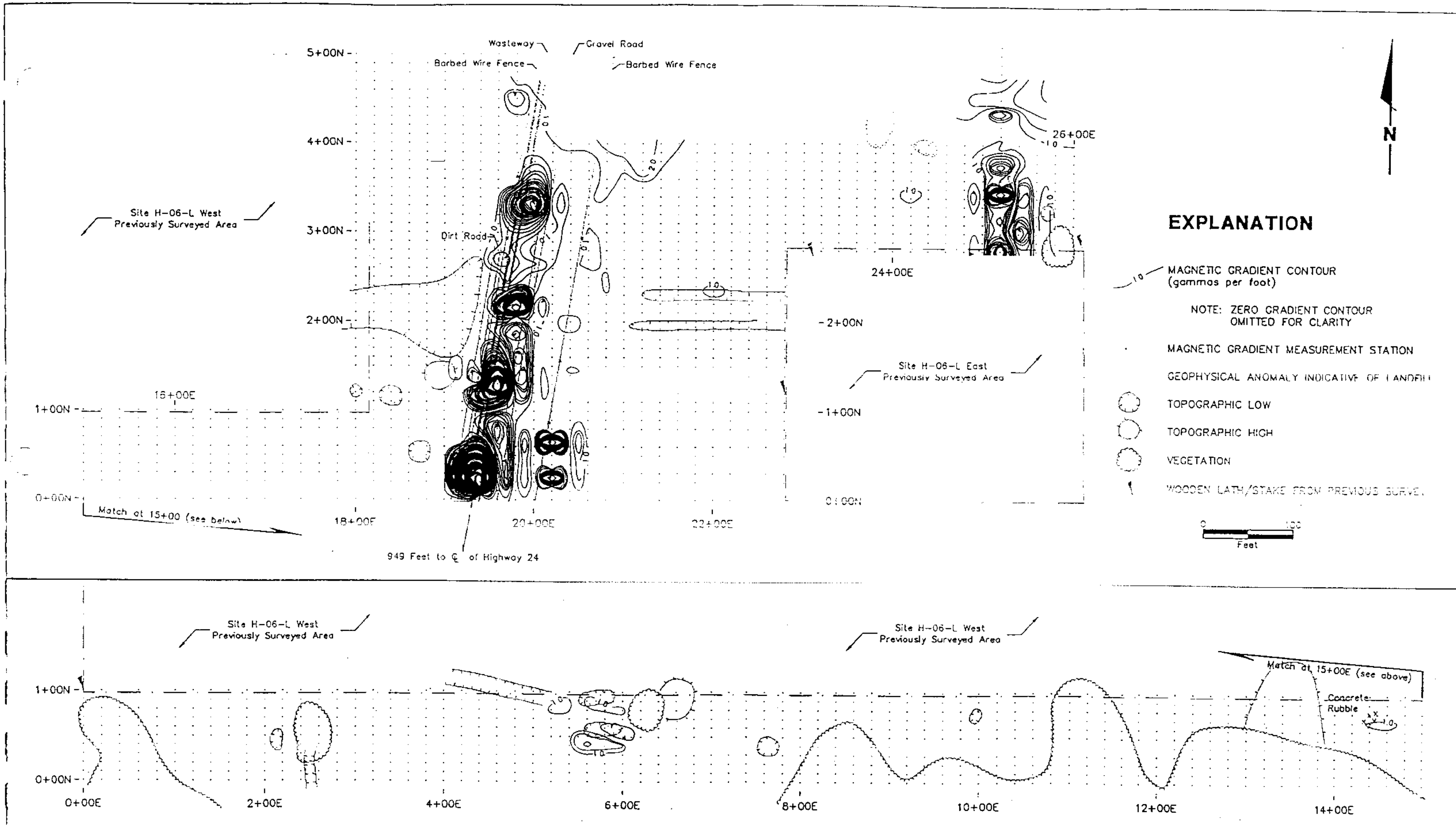

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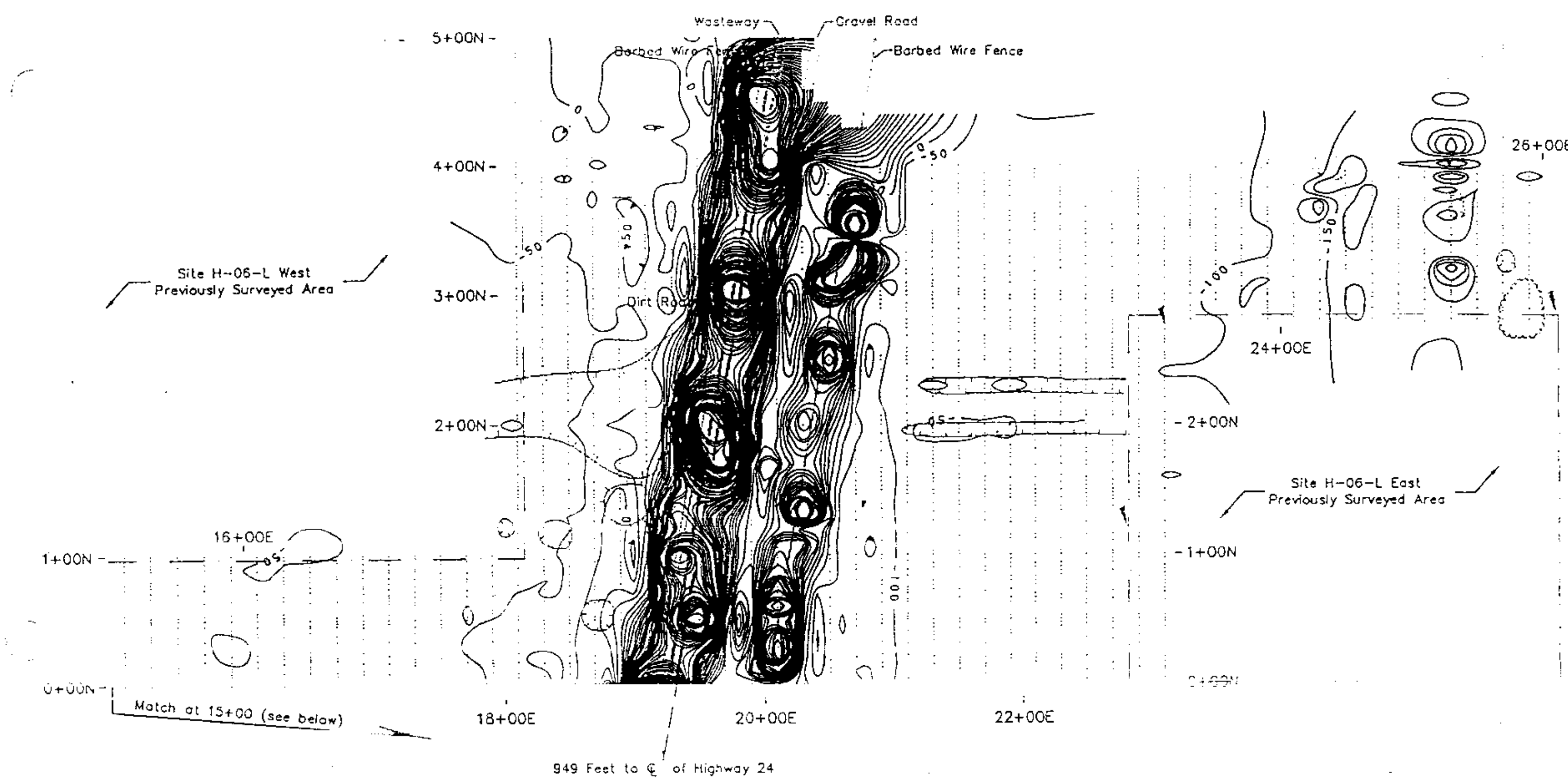
Environmental Services

Magnetic Gradient Contour Map
Site H-06-L, East and West
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969,2	RWS	7/94	

9513396.2543



EXPLANATION

EM IN-PHASE SIGNAL CONTOUR (contour interval = 50 millivolts)

IN-PHASE SIGNAL DATA POINT USED FOR CONTOURING

TOPOGRAPHIC LOW

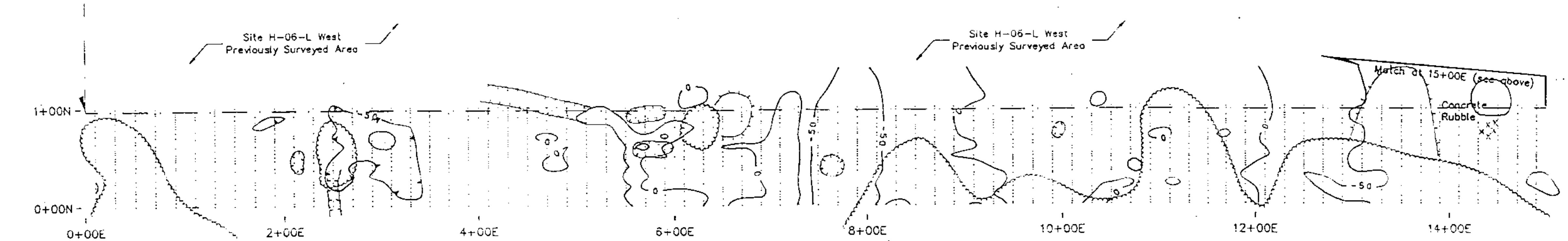
TOPOGRAPHIC HIGH

VEGETATION

WOODEN LATH/STAKE FROM PREVIOUS SURVEY

0 100
Feet

N



0 100
Feet

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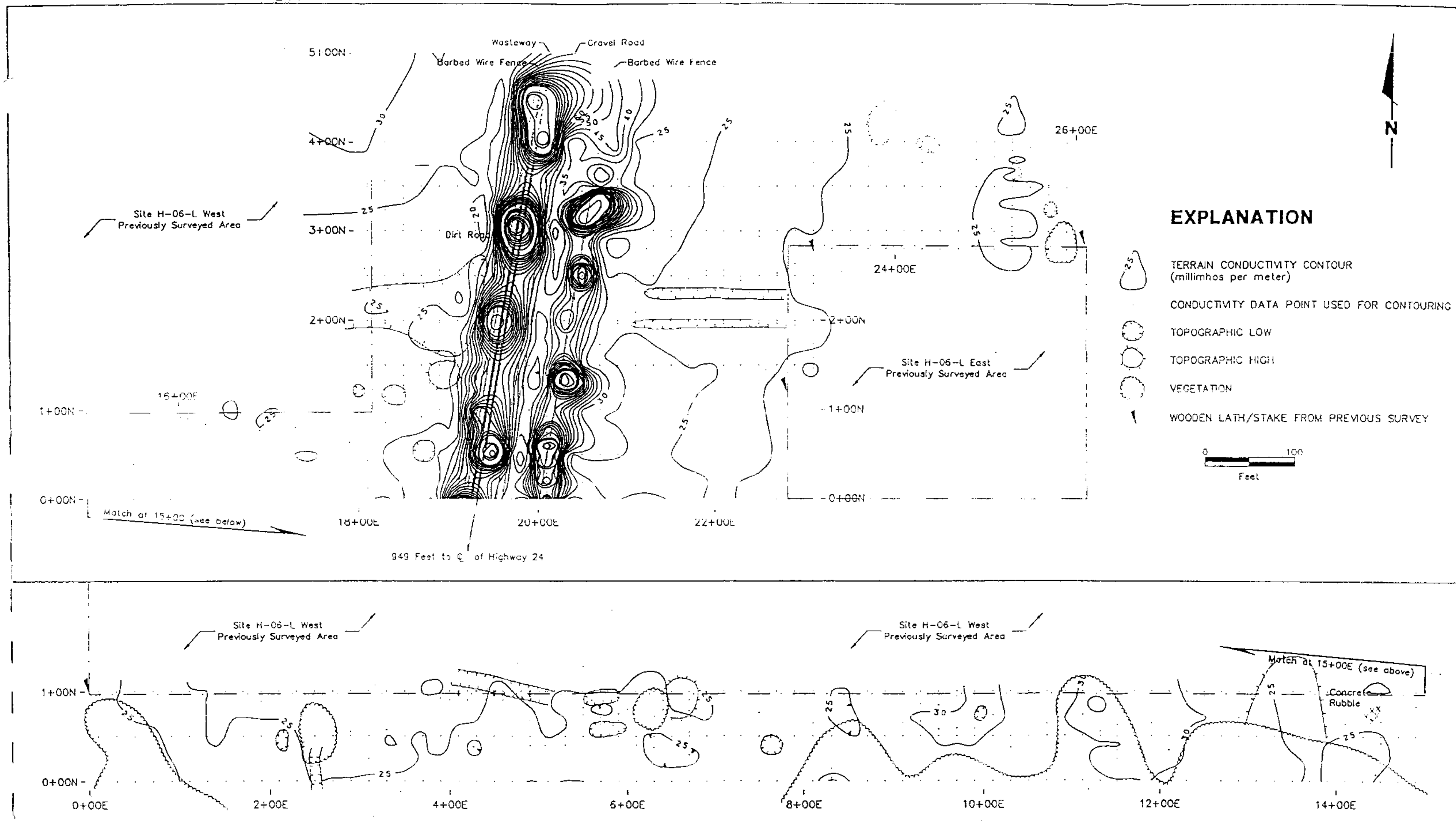
EM In-Phase Contour Map
Site H-06-L, East and West
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969.2	RWS	7/94	



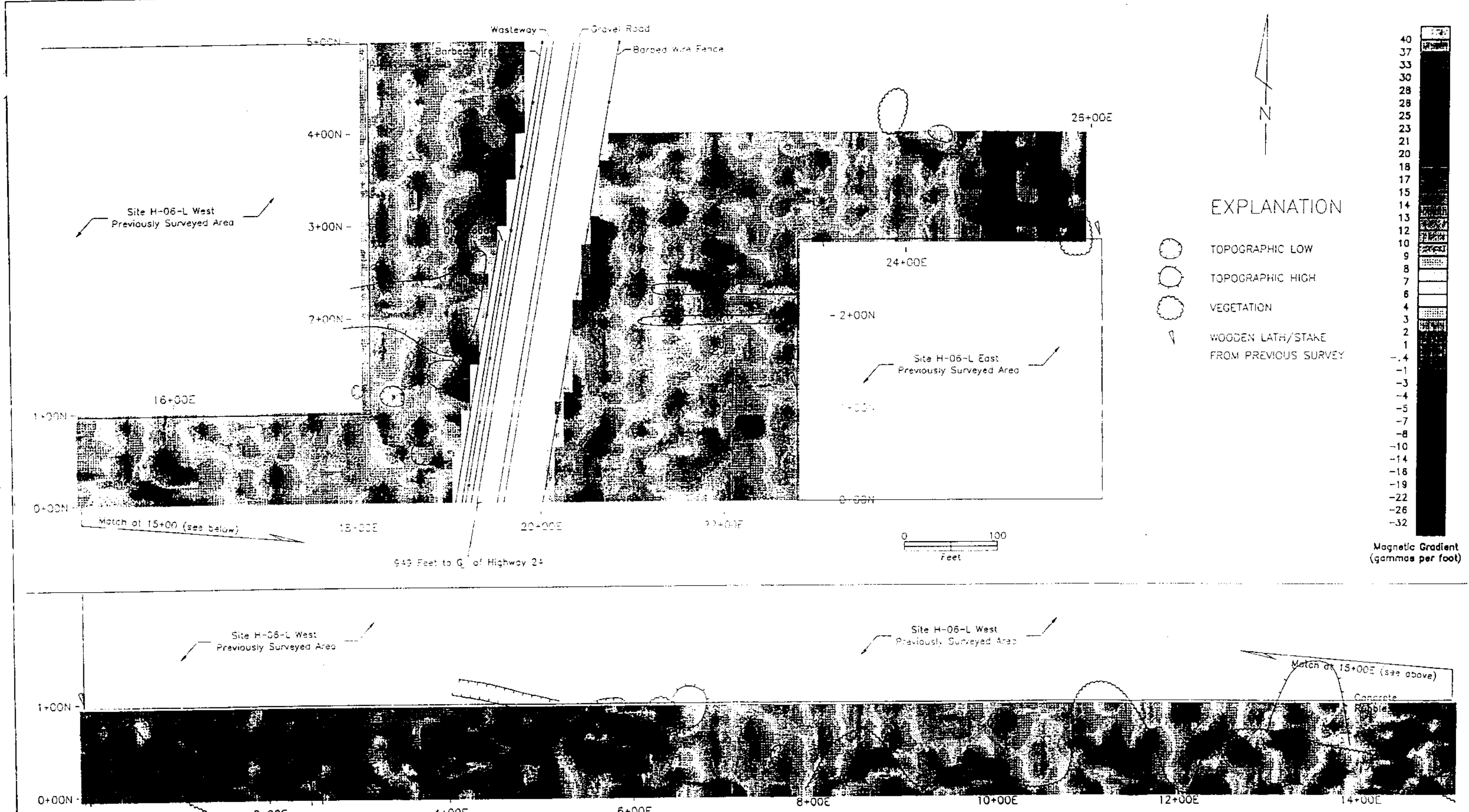
HLA

Harding Lawson Associates
Engineering and Environmental Services

Terrain Conductivity Contour Map
Site H-06-L, East and West
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **5**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969,2	RWS	7/94	



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Magnetic Gradient Color-Shaded Map
Site H-06-L, East and West
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE
6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969 2	RWS	6/94	

APPENDIX
GEOPHYSICAL METHODS AND EQUIPMENT

APPENDIX
GEOPHYSICAL METHODS AND EQUIPMENT

This section discusses the geophysical techniques used for this survey and the parameters measured by those techniques.

Electromagnetics - EM31-D

The EM methods employs a portable power source, transmitter, and receiver coils to induce and measure an electromagnetic current in the ground. Current flowing in the transmitter coil generates a magnetic field that induces small electrical currents in the ground beneath the instrument. These currents generate secondary magnetic fields that are detected by the receiver coil. The ratio of primary to secondary field strengths is proportional to terrain conductivity and can be read directly on the EM instrument meter, which is calibrated in units of conductivity. Decaying refuse and buried metal area electrically conductive compared to native soil, and therefore produce anomalous adings in measured conductivity values.

Two components of the EM field were measured: terrain conductivity (sometimes referred to as the quadrature phase component) as expressed in millimhos per meter (mmhos/m), and the in-phase component of the EM field expressed in millivolts (a measure of signal strength). Terrain conductivity data can be used to locate backfilled trenches or pits, provided the conductivity of the backfill material contrasts with the surrounding native material. The in-phase mode of the EM field is particularly sensitive to metal objects and was used to locate buried metallic debris.

A Geonics Limited Model EM31-D terrain conductivity meter, which can measure subsurface conditions to a depth of approximately 20 feet, was used in this investigation. The EM31-D was connected to a Molytek Model 221/222 portable two-channel chart recorder, and an Omnidata Polycorder Model 516 digital data logger for ›ntinuous data acquisition along the survey ˛ansects.

Electromagnetics - M-Scope

The Fisher Research Laboratory Model TW-6 M-Scope is similar in principle to the EM31-D. The unit comprises a mobile transmitter and receiver which are connected by a handle. The transmitter radiates an electromagnetic field which is detected by the receiver. Nearby metal objects cause distortions in the field. The receiver, which has been previously tuned in an area free of metal, detects the distortions and produces an audible signal when held within approximately 4 feet of metal objects. The M-Scope has the advantage of being sensitive to smaller pieces of buried metal than the EM31-D.

Magnetics

The magnetic technique measures the total intensity of the earth's magnetic field in units of magnetic intensity called gammas. Ferrous metal debris in a landfill will create variations (anomalies) in the field intensity which are recorded by the MAG instrument. The magnetic sensor is a vessel filled with a proton-rich source such as kerosene. The protons behave as small spinning magnets which orient themselves to the earth's magnetic field. A reading is initiated when an electrical current is passed through a wire coil around the sensor vessel. The current generates its own magnetic field and the protons readily align themselves to the new field. When the applied field is removed, the protons return to their original orientation. The returning motion (or precession) generates a small electrical signal that is related to the intensity of the earth's magnetic field at the sensor location. The intensity is a scalar measurement of the magnetic field vector independent of its orientation.

A pair of EG&G Geometrics, Inc., Model G-856X proton precession magnetometers were used for this survey. One was used for a base station, and the other was deployed as a gradient magnetometer. The base station uses a single magnetic sensor; it was placed in a remote location and programmed to automatically record the earth's magnetic field intensity every thirty seconds.

The gradient magnetometer uses two magnetic sensors spaced two feet apart on a staff and was carried along the survey transects. This arrangement allows for the simultaneous measurement of the magnetic field at the two sensor locations. The difference between the two values divided by 2 is the vertical magnetic gradient in gammas per foot. As the effect of localized ferrous metal on the earth's magnetic field diminishes rapidly with distance, the gradient measurement is more sensitive to buried metal than single sensor magnetic field measurements. Moreover, the effects of diurnal magnetic drift and any regional magnetic gradient are removed by the gradient measurement approach.

DISTRIBUTION

Results of Geophysical Survey
H-06-L Landfill
Hanford North Slope
Richland, Washington(Title)

July 26, 1994

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Quality Control Reviewer

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Associate Geophysicist

RWS/DWG/ld/RS043-geo

Results of Geophysical Survey
H-83-L Landfill
Hanford North Slope
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CONTENTS

1.0 INTRODUCTION 1

2.0 GEOPHYSICAL METHODS 2

3.0 SITE CHARACTERISTICS 3

4.0 FIELD PROCEDURES 4
- 4.1 WHC Anomaly Verification Survey 4
- 4.2 HLA Horizontal Control Installation 5
- 4.3 HLA Geophysical Survey 5
  - 4.3.1 Electromagnetic (EM) Profiling Survey 5
  - 4.3.2 Magnetic Gradient (MAG) Survey 6
  - 4.3.3 HLA Anomaly Verification and Detailing Survey 7
- 4.4 HLA Site Map Preparation 8

5.0 DATA ANALYSIS AND INTERPRETATION 9
- 5.1 Field Data Reduction and Interpretation 9
- 5.2 Office Data Reduction and Interpretation 9
- 5.3 Criteria Used to Estimate the Location of Landfill Cells and Buried Objects 10

6.0 RESULTS 12
- 6.1 WHC Anomaly Verification Survey 12
- 6.2 HLA Geophysical Survey 13

TABLE

1 HLA Geophysical Anomaly Locations and Characteristics, H-83-L Landfill

PLATES

1 Site Location and Survey Area Maps
2 Geophysical Survey Coverage and Results, Site H-83-L
3 Magnetic Gradient Contour Map, Site H-83-L
4 EM In-Phase Signal Contour Map, Site H-83-L
5 EM Terrain Conductivity Contour Map, Site H-83-L

APPENDIX

GEOPHYSICAL METHODS AND EQUIPMENT

DISTRIBUTION

1.0 INTRODUCTION

This report presents the results of Harding Lawson Associates' (HLA) surface geophysical investigation at the H-83-L landfill site on the North Slope of the Hanford Reservation near Richland, Washington. The purpose of the investigation was to locate areas of buried metal and delineate possible landfill cells in support of CDM Federal Programs Corporation (CDM) site characterization activities.

HLA's field investigation comprised the two work tasks described in the statement of work (SOW) telecopied by CDM to HLA on June 2, 1994:

- A survey to verify the locations of 7 geophysical anomalies identified during a geophysical investigation conducted by the Westinghouse Hanford Company (WHC) in 1991.

- A survey of adjacent previously uninvestigated areas to locate additional landfill cells, if present.

The field work was performed June 15 through 19, 1994, by HLA geophysicist Roark W. Smith of HLA's Novato, California, office, and Scott R. Yancey of HLA's Seattle, Washington, office. Guidance and logistical support were provided by Paul A. Karas and Jim Moore of CDM.

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2.0 GEOPHYSICAL METHODS

HLA used two geophysical methods during this investigation: electromagnetics (EM) and magnetics (MAG). The EM instruments used were a Geonics Model EM31-D terrain conductivity meter and a Fisher Model TW-6 M-Scope. The EM31-D was used to locate landfill cells by detecting conductivity changes associated with landfill materials. The M-Scope was used to detect shallowly buried metal typically found in landfills. The MAG instrument was a GEM Model GSM-19 magnetometer, which was used to detect ferrous metal debris. Because of vehicle access restrictions due to loose sandy soil, the presence of sensitive vegetation and the fire danger associated with the vehicles' catalytic converters, ground penetrating radar was not used. A more detailed description of the methods and equipment used is presented in the Appendix.

3.0 SITE CHARACTERISTICS

The H-83-L landfill investigation area, which includes both the HLA and WHC survey areas, is rectangular and measures approximately 600 feet east-west by 500 feet north-south (Plates 1 and 2). The site is vegetated along its perimeter, and the terrain is generally flat except for a low ridge along the southern boundary. Small amounts of localized debris, including crushed ammo crates and steel cable, were observed on the ground surface.

In 1991 WHC surveyed a 300- by 300-foot area and identified 7 geophysical anomalies. At the direction of U.S. Army Corps of Engineers representative Randy Chong, HLA extended the survey area an additional 100 feet to the north, south, and east and an additional 200 feet to the west (Plate 2). The enlarged survey area boundaries were determined based on the distribution of surface debris around the original WHC survey area.

4.0 FIELD PROCEDURES

Before each day's field work, a safety briefing was given by Mr. Karas or Mr. Moore, and operational checks were made on all functional components of the two geophysical systems. Each system was tuned to local conditions according to the manufacturers' operations manuals. A calibration point for the EM system and a base station location for the MAG system were established in an area of native soil identified during a walkaround survey. These points were occupied at the beginning and end of each day's surveying for instrument calibration and tuning. The background calibration values and tuning signal strengths were recorded in the geophysicist's field logbook.

The field work was conducted in four stages:

- WHC Anomaly Verification Survey
- HLA Horizontal Control Installation
- HLA Geophysical Survey
- HLA Site Map Preparation.

4.1 WHC Anomaly Verification Survey

The HLA geophysicist hand-carried the EM31-D and M-Scope instruments to each anomaly location shown on a map provided by CDM. In general, the 7 anomalies previously identified by WHC were marked in the field by wooden stakes, although many stakes had fallen and were not in their original position.

At each anomaly location, the HLA geophysicist first used the M-Scope to delineate areas of shallowly buried metal. The EM31-D was then used to delineate areas of anomalous conductivity indicative of more deeply buried metallic and nonmetallic landfill materials. Geophysical responses were monitored by observing the instruments' meters; no data were recorded for this survey. Areas of anomalous response were outlined on the ground with orange spray paint. Before leaving the site, the HLA geophysicist accompanied CDM representative Jim Moore on an inspection of the verified anomaly locations.

4.2 HLA Horizontal Control Installation

A control grid was installed for the HLA survey areas by using a fiberglass tape measure and survey markers remaining from the WHC investigation to establish baselines along the perimeter of the original H-83-L survey area. The baselines were marked with wooden lath at the endpoints and PVC pin flags every 20 feet. Using the tape measure to form 30-, 40-, 50-foot right triangles, survey transects were installed perpendicular to the baselines and spaced 20 feet apart. In general, the control grid consisted of rows of PVC pin flags spaced 20 feet apart. The pin flags were removed after the geophysical survey was completed, but the wooden laths along the baselines were left in place so the HLA control grid could be reestablished

4.3 HLA Geophysical Survey

4.3.1 Electromagnetic (EM) Profiling Survey

EM profiling data were obtained by hand-carrying the portable EM system along survey transects spaced 20 feet apart. The EM profiles were positioned by interpolating transect alignments midway between the rows of pin flags. Two components of the EM signal (in-phase and terrain conductivity) were digitally recorded at 1-second intervals by the data logging system. The two components were also recorded as continuous analog traces on a two-channel chart recorder. Survey transect number and instrument setting and scaling information were written on the analog records. Stationing along each transect was marked by inserting a special flagging record into the digital datafile and by scribbing the analog chart record at 20-foot intervals as a pin flag was passed. Analog EM profiles, without digital records, were also obtained along reconnaissance transects north and east of the HLA survey grid (Plate 2).

EM data were periodically transferred to a laptop computer and copied onto backup floppy disks. Each evening the analog chart records were reviewed to check that proper line number and stationing information had been recorded. Also recorded on the analog records was the name of the corresponding digital datafile. A total of 10,600 line feet of EM profiling data were collected for this investigation.

4.3.2 Magnetic Gradient (MAG) Survey

The MAG system used for this survey consisted of two magnetometers. One instrument was used as a base station and was positioned in a remote area of the site to monitor naturally occurring variations in the earth's magnetic field. The base station data were digitally recorded at 30-second intervals and transferred to a laptop computer after each field day.

A second magnetometer was used to perform the gradient survey. The gradient survey was conducted along transects spaced 20 feet apart. The MAG transects were offset 10 feet from the EM survey transects, and located along the rows of pin flags. This offset procedure produced a geophysical investigation with a 10-foot survey transect spacing.

Magnetic measurements were made by carrying the instrument along the survey transects and stopping to take readings at 10-foot intervals marked by the pin flags and at midpoints interpolated between the flags. The operator provided line and station spacing information, and the instrument automatically stored in memory the total magnetic field readings obtained at each measurement station.

At the beginning of each day's surveying, magnetic measurements were first obtained along the baseline. As the MAG survey progressed, the baseline stations were reoccupied so time-varying magnetic noise (diurnal drift) could be monitored. This procedure was performed to back up the automatically recorded base station data. In addition, at selected stations, several successive magnetic strength readings were taken to validate instrument sensitivity and reproducibility and to check for short-period magnetic noise (micropulsations or sunspot activity).

Magnetic gradient data were periodically transferred in the field to a laptop computer and copied onto backup floppy disks. Each evening the gradient data were output to a line printer and the printout was annotated with transect number, stationing, and date.

A total of 10,600 linear feet of survey transect were traversed for the MAG survey, and a total of 2,120 magnetic measurements (2 measurements at each station) were obtained for this investigation.

4.3.3 HLA Anomaly Verification and Detailing Survey

After all data geophysical data were collected and reviewed, a preliminary anomaly location map was prepared. The geophysicist returned to the field and the anomalies were resurveyed along supplemental survey transects for verification and to finalize their locations and dimensions. This procedure helped pinpoint buried objects not located directly along the survey transects and removed any positioning errors caused by the interpolation of transect and station locations. The anomaly locations and dimensions were marked on the ground with orange spray paint and labeled PVC pin flags.

4.4 HLA Site Map Preparation

A site features map was prepared by walking the survey transects and plotting the locations of notable surface features on grid paper. The site features map served as a basemap on which our final interpretation is presented. In addition, the map shows significant surface features that help reference the geophysical coverage to the survey area. The map also shows other site features, such surface metal debris, that affected the geophysical measurements. The site map was digitized for presentation in this report (Plate 2).

5.0 DATA ANALYSIS AND INTERPRETATION

5.1 Field Data Reduction and Interpretation

EM chart records were inspected each evening for anomalous responses indicative of buried metal or other landfill materials. The printouts of the digital MAG gradient data were also inspected for anomalous readings indicative of buried ferrous metal. A diurnal drift curve was prepared from the MAG base station data using the software program GRAPHER. This curve was inspected for any large naturally occurring magnetic variations that could produce false anomalies and necessitate resurveying of selected MAG transects.

The locations of anomalous EM and MAG responses were plotted on the hand-drawn site features map. A copy of this map was provided to Mr. Moore to help direct CDM's ongoing excavation and trenching program.

5.2 Office Data Reduction and Interpretation

Upon the geophysicist's return to HLA's Novato, California, office, the digital EM data were output to a printer for checking and editing to ensure that proper station markers were in place. The EM data files were then processed using an HLA in-house software program that separates the terrain conductivity and in-phase data into different data files and assigns X-Y locations to each value. MAG data were reduced using Lotus 123 spreadsheet software to assign X-Y locations for each station.

Computer contour maps of the magnetic gradient (Plate 3), EM in-phase signal (Plate 4), and EM terrain conductivity (Plate 5) were generated using the Geosoft Mapping System, distributed by GEOSOFT, Inc., Toronto, Canada.

5.3 Criteria Used to Estimate the Location of Landfill Cells and Buried Objects

EM anomalies associated with subsurface disposal areas are usually evaluated in terms of increases in terrain conductivity over an established background value and/or changes in the in-phase signal. Background EM conductivity data obtained in areas of native-appearing soil at the H-83-L site were approximately 10 millihmos per meter (mmhos/m). The EM in-phase signal generally ranged between +50 and -50 millivolts.

The presence of subsurface disposal areas can be inferred from localized EM readings above or below background values, indicating the presence of subsurface features different from those in surrounding unaffected areas. A rapid change in in-phase response is an indicator of nearby metal. The amount of variation from background readings can provide an indication of the amount of landfill material present and/or its depth of burial.

Magnetic data show that the background total field strength is approximately 55,600 gammas, and the background magnetic gradient was generally less than 10 gammas per foot (gpf). The presence of buried ferrous metal can be inferred from localized readings above these background values. As with EM data, the amount of variation from background can provide an indication of the amount of ferrous metal present and/or its depth of burial.

The extent of disposal areas is determined by correlating areas of anomalous geophysical response between adjacent survey transects. Anomalous responses occurring in the same area along several adjacent transects are indicative of larger landfill cells, while anomalous responses that occur along a single transect without corresponding anomalies on adjacent transects are indicative of more localized debris.

Computer contour maps are often helpful when inspecting large data sets for indications of disposal areas. Widespread EM and MAG anomalies indicative of large landfill cells are generally apparent as areas of tightly bunched contours. Color-shaded maps can further emphasize anomalous areas; however, because averaging and smoothing of the data occur during computer processing, the resulting contour maps often do not show the actual distribution of anomalous measurements, especially for more localized anomalies or along sharp boundaries between anomalous and background responses. A review of the analog EM chart records and an inspection of the gradient measurements on the MAG data printout was performed to determine the anomaly locations shown on Plate 2. This procedure is often more helpful when locating smaller concentrations of subsurface debris and delineating the limits of larger landfill cells more exactly.

6.0 RESULTS

6.1 WHC Anomaly Verification Survey

WHC anomalies A-1 through A 5 indicated on the map provided by CDM were verified by HLA. In general, these WHC anomaly locations corresponded to the mapped locations and to the placement of wooden stakes in the field. EM31-D and M-Scope scans indicated the presence of abundant metal debris in the shallow (upper 5 feet or less) subsurface at most anomaly locations. EM31-D scans also indicated the presence of more deeply buried metallic and nonmetallic debris.

No anomalous responses at WHC locations A-6 and A-7 were noted by the HLA geophysicist. HLA believes that anomalous responses previously measured at these locations were caused by surface and ry-near-surface metal objects that were subsequently removed during cleanup operations by CDM's excavation subcontractor. Specifically, anomaly A-6 was associated with pint- and quart-sized oil cans and wood telephone poles. While these objects were documented on the provided site map and also observed by the HLA geophysicist during the site orientation walkthrough, they were removed before HLA returned to survey the area. In addition, the HLA geophysicist removed a partially buried metal garbage can lid from the A-7 anomaly location before surveying that area.

Anomaly dimensions determined by HLA differed slightly from those indicated by WHC. The differences were insignificant and are attributed to HLA's free-walking verification survey, which was not confined to pre-established survey transects. By scanning along numerous crossing and intermediate traverses, the HLA geophysicist was able to more precisely delineate localized metal debris that strongly influenced anomaly dimensions.

6.2 HLA Geophysical Survey

Three additional anomalies, designated A-8 through A-10, were identified by HLA. The anomaly locations and approximate dimensions are shown on Plate 2. The magnetic gradient contour map is shown on Plate 3. The EM in-phase contour maps and EM conductivity are shown on Plates 4 and 5, respectively. Table 1 summarizes the anomaly locations and characteristics.

In general, the geophysical anomalies identified by HLA at site H-83-L are characterized by groupings of localized anomalous responses indicative of buried metal. These groupings probably delineate larger disposal areas containing both metallic and nonmetallic debris. The anomalous areas depicted on Plate 2 show the interpreted extent of subsurface disposal based on the distribution of more the localized anomalous responses within these areas. A more detailed discussion of anomaly characteristics follows.

Anomaly A-8 is in the northwest portion of the survey area near HLA grid coordinate 3+50N, 1+80E. The anomaly is shown on Plate 2 as two sub-areas. The larger sub-area to the south measures approximately 40 by 80 feet and is characterized by several closely spaced high amplitude MAG gradient anomalies of approximately 100 gammas per foot (gpf) and anomalous EM in-phase signal strengths of -500 millivolts (mv). The smaller sub-area to the north measures approximately 15 by 20 feet and is characterized by MAG gradients of 140 gpf with an EM in-phase anomaly of approximately 200 mv.

These responses are indicative of moderate amounts of ferrous metal buried approximately 5 feet below the surface. The two sub-areas may represent a single disposal pit; however, data obtained along transects 3+90N through 4+10N, between the two sub-areas, do not show anomalous responses indicative of non-native material. This result indicates two isolated disposal areas, although it is possible that a small amount of nonmetallic debris may be present between the two areas.

Anomaly A-9 is at the northern edge of the survey area, near grid coordinates 4+80N, 3+50E (Plate 2). Supplemental geophysical survey data were obtained north of the survey grid to delineate the northern extent of this anomaly. Anomaly A-9 measures approximately 30 feet by 40 feet, and is characterized by MAG gradient anomalies of 220 gpf and anomalous EM in-phase signal strengths of approximately 800 mv. These responses are indicative of larger amounts of buried ferrous metal. The associated terrain conductivity anomalies are probably caused by buried metal and are not indicative of changes is soil properties.

Anomaly A-9 coincides with a shallow rectangular depression approximately 10 feet by 40 feet that appears to be a backfilled trench. EM in-phase anomalies and the highest MAG gradient readings were recorded within this area; however, lower MAG gradient anomalies of approximately 40 gpf were recorded within a 20-foot area around the apparent trench. These readings are possibly caused by localized near-surface metal outside the trench or by a large metal mass in the trench itself.

Anomaly A-10 is along the eastern edge of the survey area, near grid coordinates 1+50N, 6+00E. The anomaly consists of three sub-areas: a large area to the east measuring approximately 30 by 80 feet, and two small sub-areas to the west. Most of the east area is outside the survey grid, and supplemental geophysical survey data were obtained to delimit this anomaly. The east sub-area is characterized by several localized MAG gradient anomalies of approximately 150 gpf. This sub-area also exhibited EM in-phase anomalies during the verification survey but, as it is outside the survey grid, the millivolt anomaly values were not recorded. The geophysical anomalies recorded in the east area are indicative of substantial amounts of metal buried approximately 5 feet deep. The alignment of several localized anomalies in the east sub-area is indicative of a continuous disposal trench containing metallic and nonmetallic debris.

Of the two west sub-areas, the northern area exhibits a moderate EM in-phase anomaly of approximately 100 mv, without an associated MAG gradient anomaly. This response is indicative of a small elongated metal mass such as a steel cable or a piece of sheet metal similar to that found and removed from a nearby area. The southern area of the west sub-areas is characterized by a MAG gradient of 100 g/m and anomalous EM in-phase signals of approximately 200 mv, indicative of a larger metal mass.

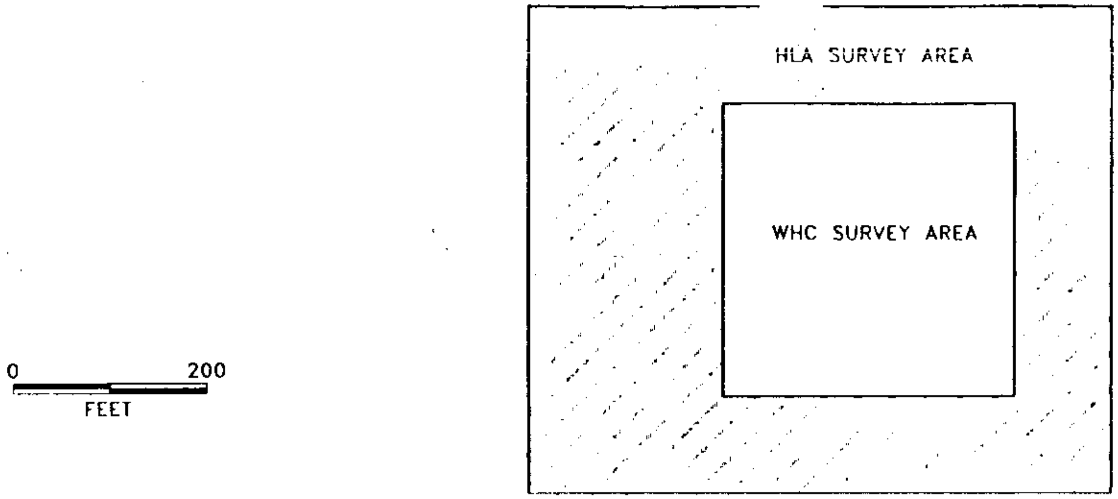
TABLE

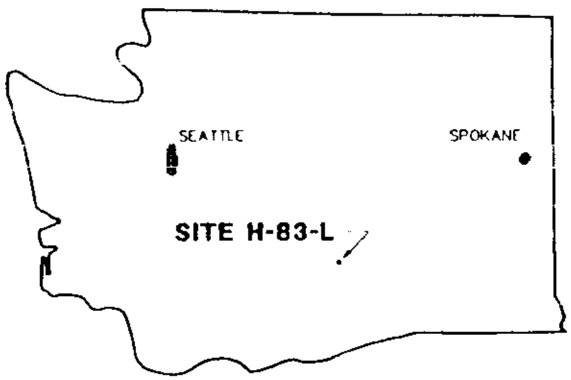
Table 1. Geophysical Anomaly Locations and Characteristics, H-83-L Landfill
Hanford North Slope
Richland, Washington

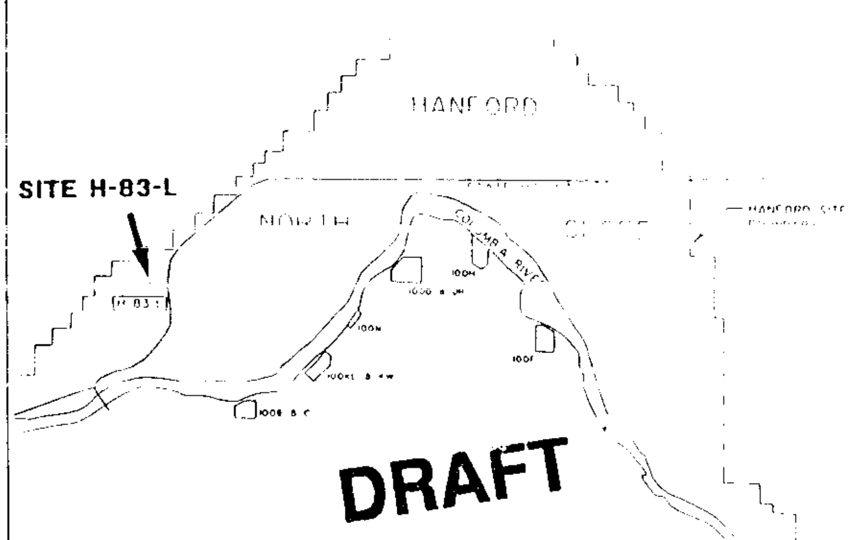
Anomaly Designation	Survey Grid Coordinates (ft)	Anomaly Dimension (ft)	Approx. Depth of Burial (ft)	Interpretation of Subsurface Characteristics
A-8	N3+50, E 1+80	40 x 80	5	Disposal trench with metal and non-metal debris; localized shallow metal nearby
A-9	N 4+80, E 3+50	30 x 40	5	Disposal trench with metal and non-metal debris; possible small metal debris nearby
A-10	N 1+50, E 6+00	30 x 80	5	Disposal trench with metal and non-metal debris; smaller disposal pits nearby

PLATES

E H-83-L







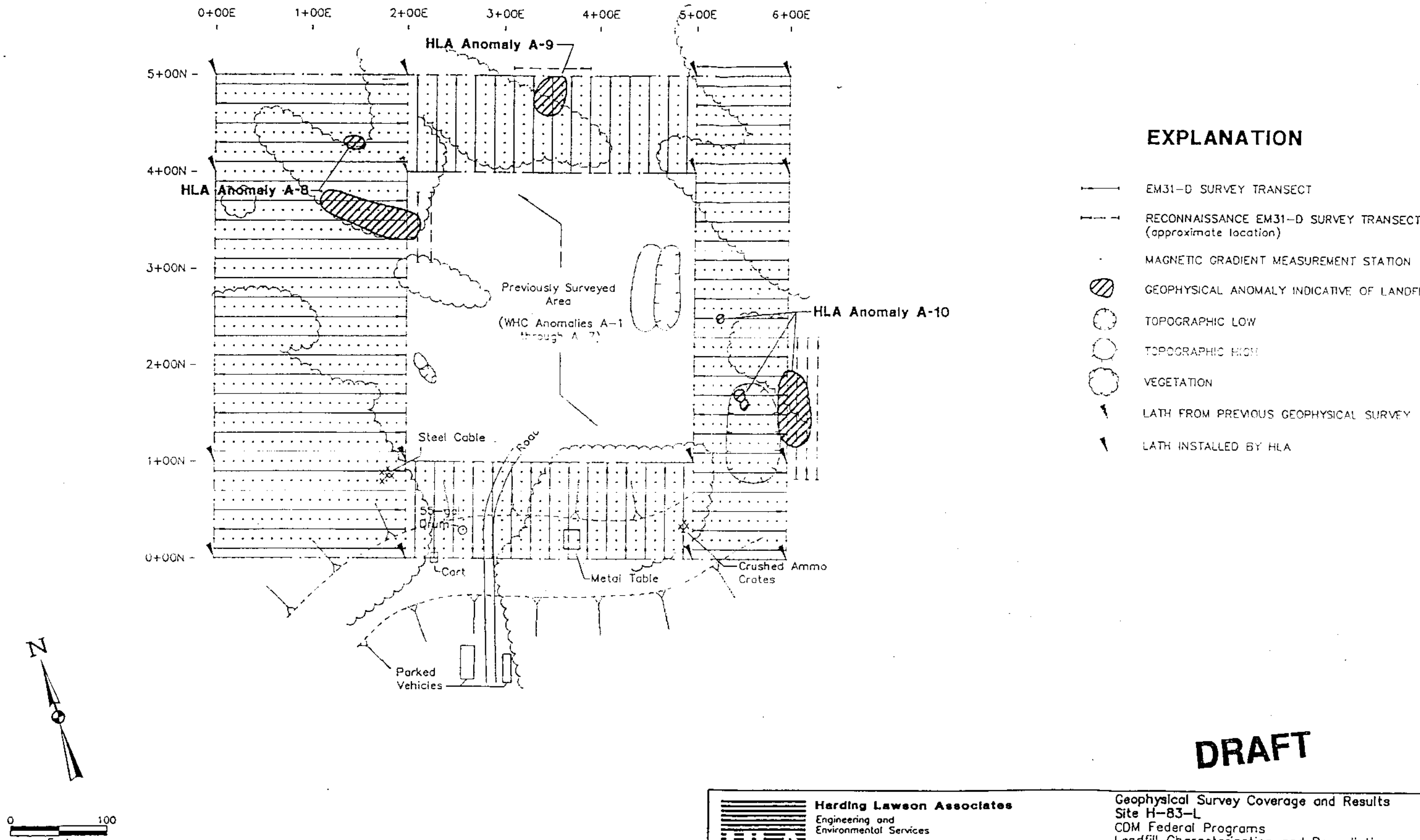
N

Harding Lawson Associates
Engineering and
Environmental Services

Site Location and Survey Area Maps
Site H-83-L
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969.2		8/94	



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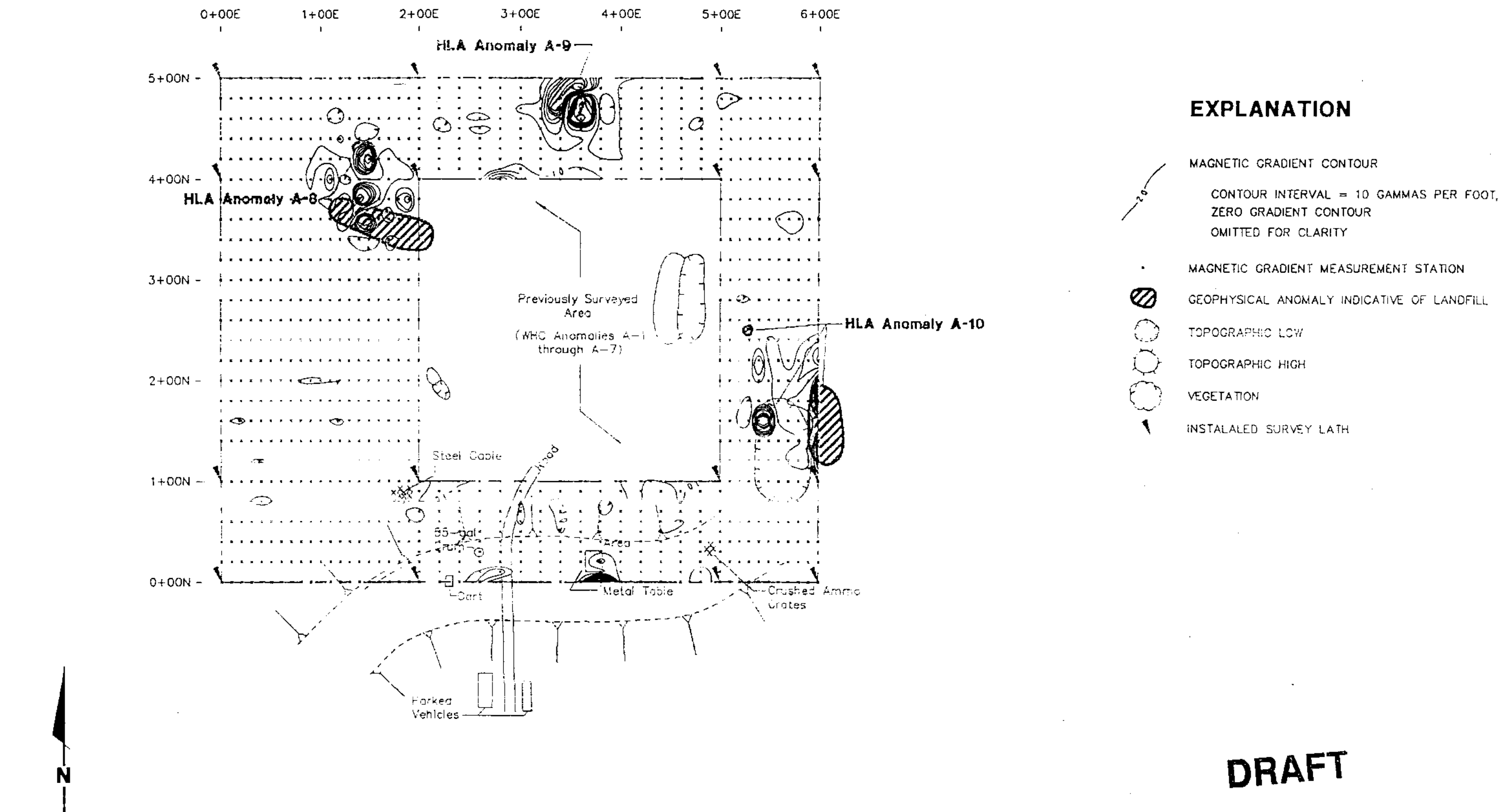
Geophysical Survey Coverage and Results
Site H-83-L
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969,2		7/94	



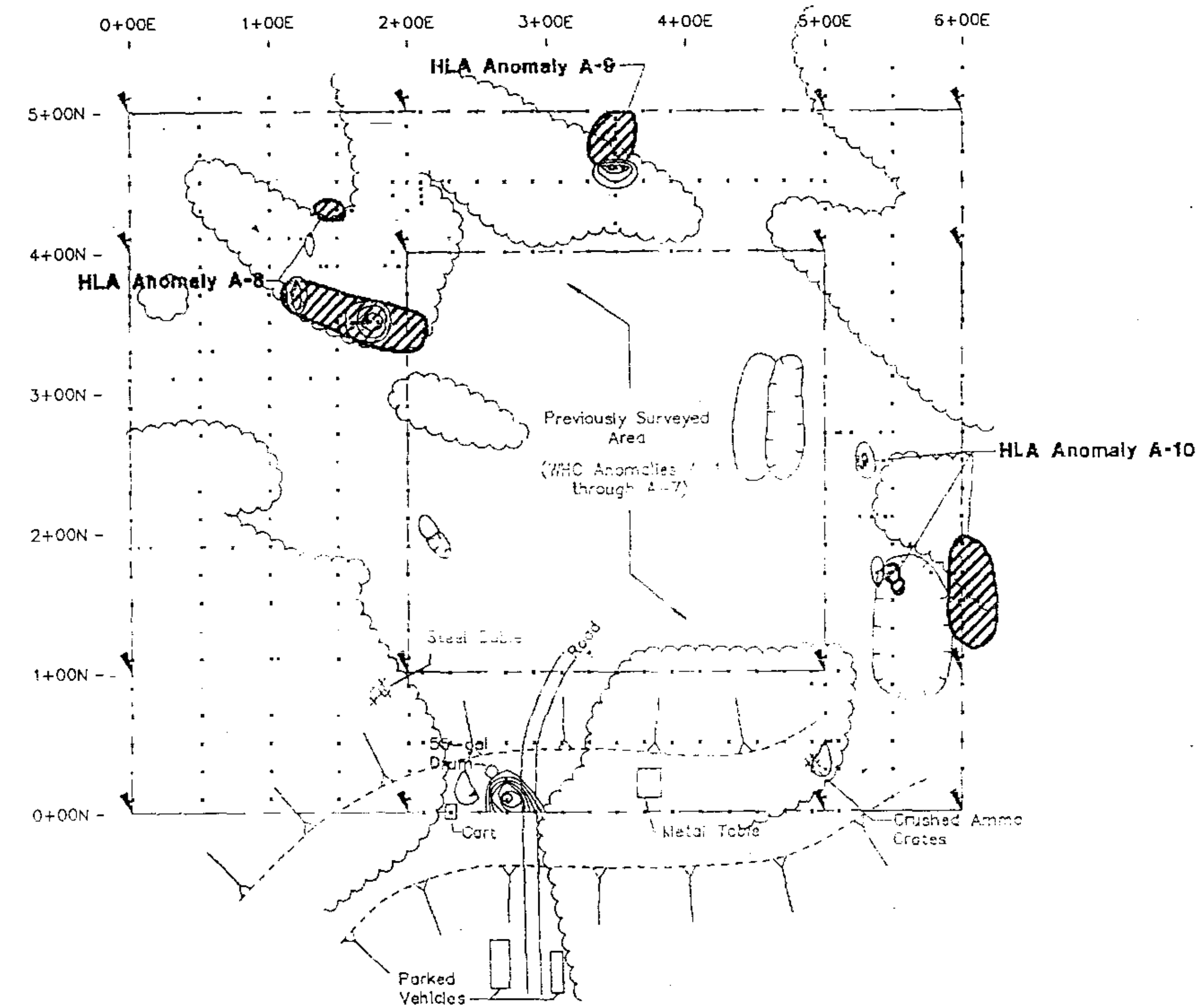
HLA

Harding Lawson Associates
Engineering and Environmental Services

Magnetic Gradient Contour Map
Site H-83-L
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969,2		8/94	



N

0 100
Feet

EXPLANATION

EM IN-PHASE SIGNAL CONTOUR
CONTOUR INTERVAL = 50 MILLIVOLTS,
ZERO MILLIVOLT CONTOUR
OMITTED FOR CLARITY

IN-PHASE SIGNAL DATA POINT USED FOR CONTOURING

GEOPHYSICAL ANOMALY INDICATIVE OF LANDFILL

TOPOGRAPHIC LOW

TOPOGRAPHIC HIGH

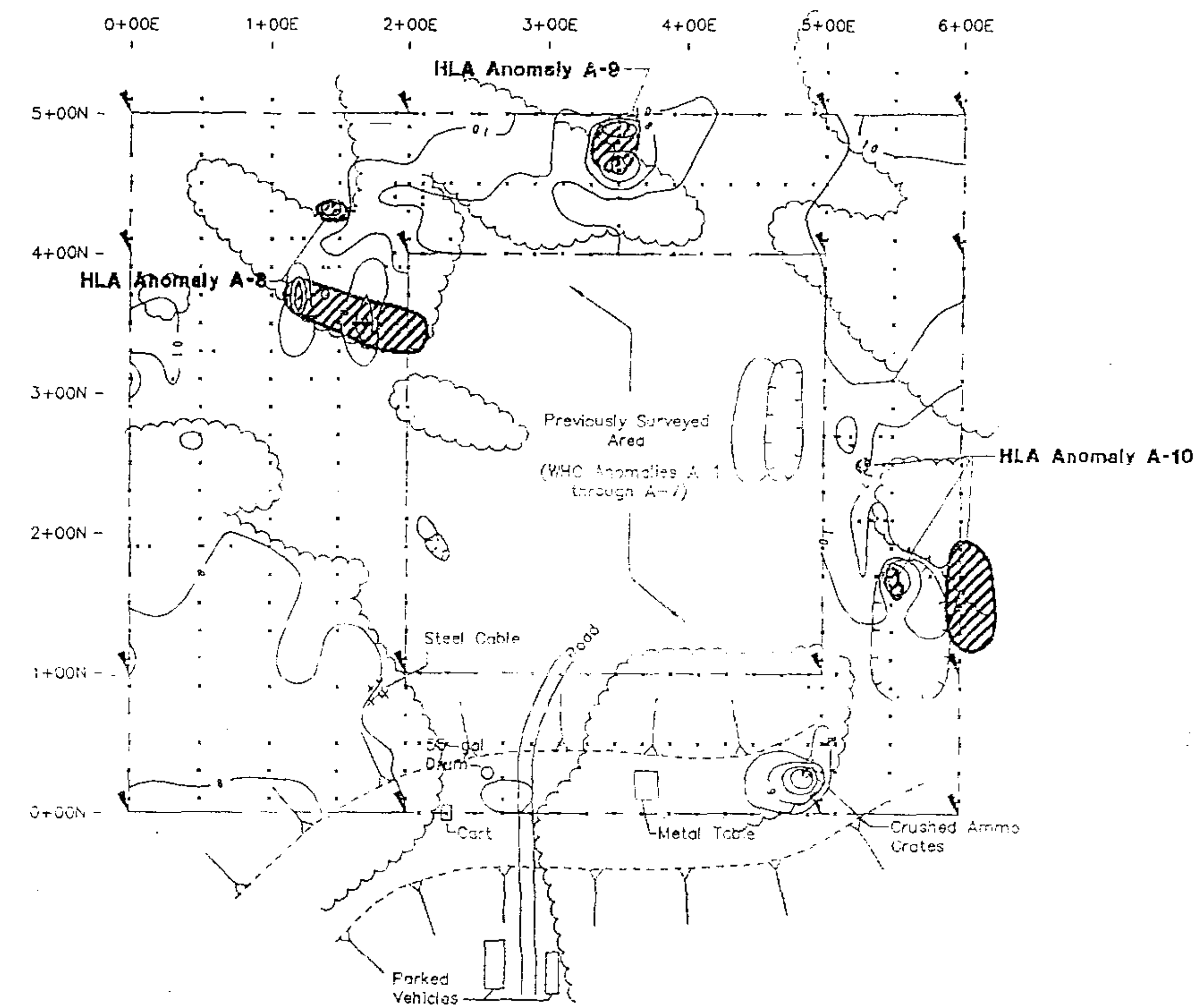
VEGETATION

INSTALLED SURVEY LATH

DRAFT

Harding Lawson Associates Engineering and Environmental Services		EM In-Phase Signal Contour Map Site H-83-L CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington	PLATE **4**
DRAWN Rws	JOB NUMBER 27969,2	APPROVED	DATE 8/94

REVISED DATE



N

0 100
Feet

EXPLANATION

TERRAIN CONDUCTIVITY CONTOUR
CONTOUR INTERVAL = 2 MILLIMHOS PER METER

CONDUCTIVITY DATA POINT USED FOR CONTOURING

GEOPHYSICAL ANOMALY INDICATIVE OF LANDFILL

TOPOGRAPHIC LOW

TOPOGRAPHIC HIGH

VEGETATION

INSTALLED SURVEY LATH

DRAFT

Harding Lawson Associates
Engineering and
Environmental Services

Terrain Conductivity Contour Map
Site H-83-L
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **5**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969,2		8/94	

APPENDIX

GEOPHYSICAL METHODS AND EQUIPMENT

APPENDIX

This section discusses the geophysical techniques used for this survey and the parameters measured by those techniques.

Electromagnetics - EM31-D

The EM methods employs a portable power source, a transmitter, and receiver coils to induce and measure an electromagnetic current in the ground. Current flowing in the transmitter coil generates a magnetic field that induces small electrical currents in the ground beneath the instrument. These currents generate secondary magnetic fields that are detected by the receiver coil. The ratio of primary to secondary field strengths is proportional to terrain conductivity and can be read directly the EM instrument meter, which is calibrated in units of conductivity. Decaying refuse and buried metal are electrically conductive compared to native soil, and therefore produce anomalous readings in measured conductivity values.

Two components of the EM field were measured: terrain conductivity (sometimes referred to as the quadrature phase component) as expressed in millimhos per meter (mmhos/m), and the in-phase component of the EM field, expressed in millivolts (a measure of signal strength). Terrain conductivity data can be used to locate backfilled trenches or pits, provided the conductivity of the backfill material contrasts with that of the surrounding native material. The in-phase mode of the EM field is particularly sensitive to metal objects and was used to locate buried metallic debris.

A Geonics Limited Model EM31-D terrain conductivity meter, which can measure subsurface conditions to a depth of approximately 20 feet, was used in this investigation. The EM31-D was nnected to a Molytek Model 221/222 portable two-channel chart recorder and an Omnidata

Polycorder Model 516 digital data logger for continuous data acquisition along the survey transects.

Electromagnetics - M-Scope

The Fisher Research Laboratory Model TW-6 M-Scope is similar in principle to the EM31-D. The unit comprises a mobile transmitter and a receiver, which are connected by a handle. The transmitter radiates an electromagnetic field that is detected by the receiver. Nearby metal objects cause distortions in the field. The receiver, which has been previously tuned in an area free of metal, detects the distortions and produces an audible signal when held within approximately 4 feet of metal objects. The M-Scope has the advantage of being sensitive to smaller pieces of buried metal than the EM31-D.

Magnetics

The magnetic technique measures the total intensity of the earth's magnetic field in units of magnetic intensity called gammas. Ferrous metal debris in a landfill creates variations (anomalies) in field intensity; the MAG instrument records these anomalies The magnetic sensor is a vessel filled with a proton-rich source such as kerosene. The protons behave as small spinning magnets, which orient themselves to the earth's magnetic field A reading is initiated when an electrical current is passed through a wire coil around the sensor vessel. The current generates its own magnetic field and the protons readily align themselves to the new field. When the applied field is removed, the protons return to their original orientation. The returning motion (or precession) generates a small electrical signal that is related to the intensity of the earth's magnetic field at the sensor location. The intensity is a scalar measurement of the magnetic field vector independent of its orientation.

A pair of GEM Model GSM-19 proton precession magnetometers were used for this survey. One was used as a base station, and the other was deployed as a gradient magnetometer. The base station uses a single magnetic sensor; it was placed in a remote location and programmed to automatically record the earth's magnetic field intensity every thirty seconds.

The gradient magnetometer uses two magnetic sensors spaced 2 feet apart on a staff and was carried along the survey transects. This arrangement allows for simultaneous measurement of the magnetic field at the two sensor locations. The difference between the two values divided by 2 is the vertical magnetic gradient in gammas per foot. As the effect of localized ferrous metal on the earth's magnetic field diminishes rapidly with distance, the gradient measurement is more sensitive to buried metal than single sensor magnetic field measurements. Moreover, the effects of diurnal magnetic drift and any regional magnetic gradient are removed by the gradient measurement approach.

DISTRIBUTION

Results of Geophysical Survey
H-83-L Landfill
Hanford North Slope
Richland, Washington

August 24, 1994

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David W. Gibbs, G.P. 656
Associate Geophysicist

RWS/MJR/ld/RS060-geo

TRANSMITTAL

To: Mr. Jim Moore
CDM Federal Programs Corporation
1626 Coal Boulevard, Suite 100
Golden, Colorado 80401

From: Roark Smith RWS

Date: September 2, 1994

Subject: Hanford North Slope - Ten Potential Landfill Sites

Project No.: 27969 6

Enclosed please find one unbound copy of Harding Lawson Associates' draft report *Results of Geophysical Surveys at Ten Potential Landfill Sites, Hanford North Slope, Richland, Washington.* If you should have any questions or comments, please feel free to contact me at 415/884-3302.

ld/RS068-geo

Results of Geophysical Surveys at Ten Potential Landfill Sites Hanford North Slope Richland, Washington

Prepared for

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CONTENTS

1.0 INTRODUCTION 1

2.0 GEOPHYSICAL METHODS 2

3.0 GENERAL FIELD PROCEDURES 3
- 3.1 Horizontal Control Installation 3
- 3.2 Geophysical Survey 4
  - 3.2.1 Electromagnetic (EM) Profiling Survey 4
  - 3.2.2 Magnetic Gradient (MAG) Survey 5
  - 3.2.3 Anomaly Verification and Detailing Survey 6
- 3.4 Site Map Preparation 7

4.0 DATA ANALYSIS AND INTERPRETATION 8
- 4.1 Field Data Reduction and Interpretation 8
- 4.2 Office Data Reduction and Interpretation 8
- 4.3 Criteria Used to Estimate the Location of Landfill Cells and Buried Objects 9

5.0 SITE CHARACTERISTICS AND RESULTS 11
- 5.1 Site H-81-R 12
  - 5.1.1 Site Description 12
  - 5.1.2 Results, H-81-R 12
- 5.2 Site PSN 72/82 13
  - 5.2.1 Site Description 13
  - 5.2.2 Results, PSN 72/82 13
- 5.3 Site PSN 90 13
  - 5.3.1 Site Description 13
  - 5.3.2 Results, PSN 90 14
- 5.4 Site Igloo-1 16
  - 5.4.1 Site Description 16
  - 5.4.2 Results, Igloo-1 16
- 5.5 Site Igloo-2 17
  - 5.5.1 Site Characteristics 17
  - 5.5.2 Results, Igloo-2 17
- 5.6 Site Bridge Overview-1 18
  - 5.6.1 Site Description 18
  - 5.6.2 Results, Bridge Overview-1 18
- 5.7 Site Bridge Overview-2 19
  - 5.7.1 Site Description 19
  - 5.7.2 Results, Bridge Overview-2 20
- 5.8 Site H-12-C 20
  - 5.8.1 Site Description 20
  - 5.8.2 Results, H-12-C 20
- 5.9 Site H-83-C 21
  - 5.9.1 Site Description 21
  - 5.9.2 Results, H-83-C 21
- 5.10 PSN 12/14 22
  - 5.10.1 Site Characteristics 22
  - 5.10.2 Results, PSN 12/14 23

5.11	Site PSN 01	24
	5.11.1 Site Characteristics	24
	5.11.2 Results, PSN 01	24
5.12	Site H-12-L-1	25
	5.12.1 Site Characteristics	25
	5.12.2 Results, H-12-L-1	25
5.13	Site H-12-L-2	26
	5.13.1 Site Characteristics	26
	5.13.2 Results, H-12-L-2	27
5.14	Site PSN 04	27
	5.14.1 Site Characteristics	27
	5.14.2 Results, PSN 04	28

TABLES

1 Summary of Results, Ten Potential Landfill Sites
2 Geophysical Anomaly Locations and Characteristics, PSN 12/14 Landfill

PLATES

1 Location Map, Ten Potential Landfill Sites
2 Geophysical Survey Coverage and Results, Site H-81-R
3 Contour Maps of Geophysical Datasets, Site H-81-R
4 Geophysical Survey Coverage and Results, Site PSN 72/82
5 Contour Maps of Geophysical Datasets, Site PSN 72/82
6 Geophysical Survey Coverage and Results, Site PSN 90
7 Magnetic Gradient Contour Map, Site PSN-90
8 EM In-Phase Signal Contour Map, Site PSN-90
9 Terrain Conductivity Contour Map, Site PSN-90
10 Geophysical Survey Coverage and Results, Site Igloo-1
11 Geophysical Survey Coverage and Results, Site Igloo-2
12 Contour Maps of Geophysical Datasets, Site Igloo-2
13 Geophysical Survey Coverage and Results, Site Bridge Overview-1
14 Contour Maps of Geophysical Datasets, Site Bridge Overview-1
15 Geophysical Survey Coverage and Results, Site Bridge Overview-2
16 Geophysical Survey Coverage and Results, Site H-12-C
17 Geophysical Survey Coverage and Results, Site H-83-C
18 Magnetic Gradient Contour Map, Site H-83-C
19 EM In-Phase Contour Map, Site H-83-C
20 Terrain Conductivity Contour Map, Site H-83-C
21 Geophysical Survey Coverage and Results, Site PSN 12/14
22 Magnetic Gradient Contour Map, Site PSN 12/14
23 EM In-Phase Contour Map, Site PSN 12/14
24 Terrain Conductivity Contour Map, Site PSN 12/14
25 Geophysical Survey Coverage and Results, Site PSN-01
26 Geophysical Survey Coverage and Results, Site H-12-L-1
27 Contour Maps of Geophysical Datasets, Site H-12-L-1
28 Geophysical Survey Coverage and Results, Site H-12-L-2

APPENDIX

GEOPHYSICAL METHODS AND EQUIPMENT

DISTRIBUTION

1.0 INTRODUCTION

This report presents the results of Harding Lawson Associates' (HLA) surface geophysical investigation at 10 potential landfill sites (13 survey areas) on the North Slope of the Hanford Reservation near Richland, Washington. The ten sites are H-81-R, PSN 72/82, PSN-90, Igloo (two areas), Bridge Overview (two areas), H-12-C, H-83-C, PSN 12/14, PSN 01, and H-12-L (two areas) (Plate 1). Additionally, a confirmation survey was conducted at Site PSN 04 to verify the location of previously staked geophysical anomalies. The purpose of the investigation was to locate areas of buried metal and delineate possible landfill cells in support of CDM Federal Programs Corporation (CDM) site characterization activities. The scope and work procedures of HLA's investigation were described in the statement of work (SOW) telecopied by CDM to HLA on June 9, 1994.

The field work was performed during three work periods. The first work period lasted from June 19 through July 2, 1994, and was staffed by HLA geophysicist Roark W. Smith of HLA's Novato, California, office, and Gretchen R. Miller and Joanne A. Winters of HLA's Seattle, Washington, office. The second and third work periods lasted from July 5 through 15, and August 3 through August 4, 1994, and were staffed by Brian W. Hecker of HLA's Novato, California, office and Joanne A. Winters of HLA's Seattle, Washington, office. Guidance and logistical support were provided by Paul A. Karas and Jim Moore of CDM. Most of the field work was observed by various U.S. Army Corps of Engineers (COE) representatives.

This document was prepared for the sole use of CDM Federal Programs Corporation and its authorized subcontractors. No other party should rely on the information contained herein without the prior written consent of HLA.

2.0 GEOPHYSICAL METHODS

HLA used two geophysical methods during this investigation: electromagnetics (EM) and magnetics (MAG). The EM instruments used were a Geonics Model EM31-D terrain conductivity meter and a Fisher Model TW-6 M-Scope. The EM31-D was used to locate landfill cells by detecting conductivity changes associated with landfill materials. The M-Scope was used to detect shallowly buried metal typically found in landfills. The MAG instrument was a GEM Model GSM-19 magnetometer, which was used to detect ferrous metal debris. Because of vehicle access restrictions due to loose sandy soil, the presence of sensitive vegetation, and the fire danger associated with the vehicles' catalytic converters, ground penetrating radar was not used. A more detailed description of the methods and equipment used is presented in the Appendix.

3.0 GENERAL FIELD PROCEDURES

Before each day's field work, a safety briefing was given by HLA geophysics crew chief Roark W. Smith or Brian W. Hecker. Operational checks were made on all functional components of the two geophysical systems. Each system was tuned to local conditions according to the manufacturers' operations manuals. A calibration point for the EM system and a base station location for the MAG system were established at each site in an area of native soil identified during a walkaround survey. These points were occupied at the beginning and end of each day's surveying for instrument calibration and tuning. The background calibration values and tuning signal strengths were recorded in the geophysicist's field logbook.

The field work was conducted in three stages:

- Horizontal Control Installation
- Geophysical Survey
- Site Map Preparation.

3.1 Horizontal Control Installation

Twelve of the 13 investigation areas were marked prior to the geophysical survey by survey lath installed by the COE. Although the lath were not labeled, they corresponded to number designations shown on COE plot plans (Drawings HN-94-1/1, HN-94-1/2, HN-94-/3, HN-94-1/4, HN-94-1/5) provided to the HLA geophysicists. HLA understands that the boundaries of these survey areas were generally based on the distribution of surface debris, which had been removed by others before the geophysical investigations. The survey areas as marked by the COE were generally trapezoidal in shape, and HLA installed slightly larger rectangular survey grids which included the COE-designated site boundaries.

Boundary limits for Site PSN 12/14 were not previously staked. COE representative Randy Chong showed Roark Smith (HLA) and Paul Karas (CDM) the proposed survey area during a site walkthrough, and boundary marking lath were then installed by HLA.

The control grid at each site was installed by using a fiberglass tape measure to establish a baseline between two of the site boundary marking laths. The baseline was marked with wooden lath at the endpoints and PVC pin flags every 20 feet. Using the tape measure to form 30-, 40-, 50-foot right triangles, survey transects were installed perpendicular to the baseline and spaced 20 feet apart. The transects were marked by alternating rows of yellow and orange PVC pin flags; stationing along the transects was marked every 20 feet. The pin flags were removed after the geophysical surveys were completed, but the wooden laths at the grid corners were left in place so the HLA control grid could be reestablished.

3.2 Geophysical Survey

The following sections describe generalized field procedures for the collection of EM and MAG data at the 10 landfill sites (13 areas).

3.2.1 Electromagnetic (EM) Profiling Survey

EM profiling data were obtained by hand-carrying the portable EM system along survey transects spaced 20 feet apart. The EM profiles were positioned by interpolating transect alignments midway between the rows of pin flags. Two components of the EM signal (in-phase and terrain conductivity) were digitally recorded at 1-second intervals by the data logging system. The two components were also recorded as continuous analog traces on a two-channel chart recorder. Survey transect number and instrument setting and scaling information were written on the analog records. Stationing along each transect was marked by inserting a special flagging record into the digital datafile and by scribing the analog chart record at 20-foot intervals as a pin flag was passed. At selected sites, analog EM profiles, without digital records, were also obtained along reconnaissance transects outside of the HLA survey grid.

EM data were periodically transferred to a laptop computer and copied onto backup floppy disks. Each evening the analog chart records were reviewed to check that proper line number and stationing information had been recorded. Also recorded on the analog records was the name of the corresponding digital datafile.

3.2.2 Magnetic Gradient (MAG) Survey

The MAG system used for this survey consisted of two magnetometers. One instrument was used as a base station and was positioned in a remote area of the site to monitor naturally occurring variations in the earth's magnetic field. The base station data were digitally recorded at 30-second intervals and transferred to a laptop computer after each field day.

A second magnetometer was used to perform the gradient survey. The gradient survey was conducted along transects spaced 20 feet apart. The MAG transects were offset 10 feet from the EM survey transects, and located along the rows of pin flags. This offset procedure produced a geophysical investigation with a 10-foot survey transect spacing.

Magnetic measurements were made by carrying the instrument along the survey transects and stopping to take readings at 10-foot intervals marked by the pin flags and at midpoints interpolated between the flags. The operator provided line and station spacing information, and the instrument automatically stored in memory the total magnetic field readings obtained at each measurement station.

At the beginning of each day's surveying, magnetic measurements were first obtained along the baseline. As the MAG survey progressed, the baseline stations were reoccupied so time-varying magnetic noise (diurnal drift) could be monitored. This procedure was performed to back up the automatically recorded base station data. In addition, at selected stations, several successive magnetic strength readings were taken to validate instrument sensitivity and reproducibility and to check for short-period magnetic noise (micropulsations or sunspot activity).

Magnetic gradient data were periodically transferred in the field to a laptop computer and copied onto backup floppy disks. Each evening the gradient data were output to a line printer and the printout was annotated with transect number, stationing, and date.

3.2.3 Anomaly Verification and Detailing Survey

After all geophysical data at a site were collected and reviewed, a preliminary anomaly location map was prepared. The geophysicist returned to the field and the anomalies were resurveyed using the EM31-D and TW-6 M-Scope along supplemental survey transects for verification, and to refine and finalize their locations and dimensions. This procedure helped pinpoint buried objects not located directly along the survey transects and removed any positioning errors caused by the interpolation of transect and station locations. The anomaly locations and dimensions were marked on the ground with a combination of painted lath and red pin flags.

A verification and detailing survey using the procedures described above was also performed at Site PSN 04 to locate anomalies previously identified by others.

3.4 Site Map Preparation

A map for each survey area was prepared by walking the survey transects and plotting the locations of notable surface features on grid paper. The site features map served as a basemap on which our final interpretation for each site is presented. In addition, the maps show significant surface features that help reference the geophysical coverage to the survey area, as well as other site features, such surface metal debris, that affected the geophysical measurements. The site maps were digitized for presentation in this report (Plates 2, 4, 6, 10, 11, 13, 15, 16, 17, 21, 25, 26, 28).

4.0 DATA ANALYSIS AND INTERPRETATION

4.1 Field Data Reduction and Interpretation

EM chart records were inspected each evening for anomalous responses indicative of buried metal or other landfill materials. The printouts of the digital MAG gradient data were also inspected for anomalous readings indicative of buried ferrous metal. A diurnal drift curve was prepared from the MAG base station data using the software program GRAPHER. This curve was inspected for any large naturally occurring magnetic variations that could produce false anomalies and necessitate resurveying of selected MAG transects.

The locations of anomalous EM and MAG responses were plotted on the hand-drawn site features maps. A copy of each map was provided to Mr. Moore to help direct CDM's ongoing excavation and trenching program.

4.2 Office Data Reduction and Interpretation

Upon the geophysicists' return to HLA's Novato, California, office, the digital EM data were output to a printer for checking and editing to ensure that proper station markers were in place. The EM data files were then processed using an HLA in-house software program that separates terrain conductivity and in-phase data into different data files and assigns X-Y locations to each value. MAG data were reduced using Lotus 123 spreadsheet software to assign X-Y locations for each station.

Computer contour maps of the magnetic gradient, EM in-phase signal, and EM terrain conductivity were generated using the Geosoft Mapping System, distributed by GEOSOFT, Inc., Toronto, Canada.

4.3 Criteria Used to Estimate the Location of Landfill Cells and Buried Objects

EM anomalies associated with subsurface disposal areas are usually evaluated in terms of increases in terrain conductivity over an established background value and/or changes in the in-phase signal. Background EM conductivity in areas of native-appearing soil at the 13 survey areas was generally less than 10 millihmos per meter (mmhos/m). The EM in-phase signal generally ranged between +50 and -200 millivolts.

The presence of subsurface disposal areas can be inferred from localized EM readings above or below background values, indicating the presence of subsurface features different from those in surrounding unaffected areas. A rapid change in in-phase response is an indicator of nearby metal. The amount of variation from background readings can provide an indication of the amount of landfill material present and/or its depth of burial.

Magnetic data show that the background total field strength is approximately 55,600 gammas, and the background magnetic gradient at all sites was generally less than 10 gammas per foot (g/f). The presence of buried ferrous metal can be inferred from localized readings above these background values. As with EM data, the amount of variation from background can provide an indication of the amount of ferrous metal present and/or its depth of burial.

The extent of a disposal area is determined by correlating areas of anomalous geophysical response between adjacent survey transects. Anomalous responses occurring in the same area along several adjacent transects are indicative of larger landfill cells, while anomalous responses that occur along a single transect without corresponding anomalies on adjacent transects are indicative of more localized debris.

Computer contour maps are often helpful when inspecting large data sets for indications of disposal areas. Widespread EM and MAG anomalies indicative of large landfill cells are generally apparent as areas of tightly bunched contours. However, because averaging and smoothing of the data occur during computer processing, the resulting contour maps often may not show an accurate distribution of anomalous measurements, especially for more localized anomalies or along sharp boundaries between anomalous and background responses. A review of the analog EM chart records and an inspection of the gradient measurements on the MAG data printout was performed to determine the anomaly locations shown on the results maps. This procedure is often most helpful when locating smaller concentrations of subsurface debris and delineating the limits of larger landfill cells more precisely.

5.0 SITE CHARACTERISTICS AND RESULTS

Tables 1 and 2 summarize the results of the geophysical investigations at the ten potential landfill sites (13 survey areas). Geophysical anomalies indicative of subsurface debris were identified at seven of the thirteen areas investigated. The areas are Site PSN 90, Site Igloo-1, Site Igloo-2, Site Bridge Overview-1, Site H-83-C, Site PSN 12/14, and Site H-12-L-1. With the exception of Anomaly A-4 at Site PSN 90, all of the listed anomalies were identified during field data reduction and interpretation and were presented on the hand-drawn preliminary results maps provided to CDM in the field.

Anomalies at the Bridge Overview-1 site are indicative of small buried metal debris, and anomalies at PSN-90 are generally associated with a buried pipeline and large metal objects on the ground surface. The remaining four sites, Igloo-1, Igloo-2, H-83-C, and PSN 12/14, show indications of significant subsurface disposal. Large anomalies indicative of single disposal areas or a sequence of closely spaced backfilled trenches were identified at sites Igloo-1, Igloo-2, and H-83-C. Several separate disposal trenches were indicated at Site PSN 12/14, the largest of the 13 areas investigated. The terrain conductivity anomaly identified at Site H-12-L-1 is believed to be caused by increased soil moisture. The anomaly limits determined by HLA during the survey at Site PSN 04 were consistent with the areas staked in the field.

The extent and location of anomalies shown on the results maps are generally based on field checks of interpreted geophysical anomalies. Therefore, the mapped anomaly location may not always correlate well with anomaly location may not always correlate well with anomalous contours of digitally recorded geophysical data.

5.1 Site H-81-R

5.1.1 Site Description

The H-81-R investigation area was marked in the field by four COE staking lath and was very nearly rectangular. At the time of the survey, the site was sparsely vegetated and the terrain flat. No surface debris was observed. HLA used the southeast COE lath #1238 for a grid origin and extended a 160-foot-long baseline north through COE lath #1239. HLA installed a true rectangular survey grid at this site measuring 160 feet by 180 feet, or approximately 0.66 acre (Plate 2).

HLA obtained EM31-D data along approximately 1,600 linear feet of survey transect and MAG gradient measurements at 170 stations.

5.1.2 Results, H-81-R

Although no geophysical anomalies were identified within the survey grid at Site H-81-R, anomalous responses indicative of substantial buried metal were measured during a reconnaissance survey at a low mound approximately 175 feet north of the survey area (Plate 2). MAG gradients in this area were approximately 700 g/f, and EM in-phase anomalies of 500 millivolts (mv) were also measured.

Within the survey area, MAG gradients were generally less than 10 g/f. The EM in-phase signal ranged between -160 and -180 mv and the terrain conductivity was approximately 8 mmhos/m. Contour maps showing MAG gradient, EM in-phase, and terrain conductivity responses are presented on Plate 3. Because the anomalous area associated with the low mound is not within the survey grid, no digital data were recorded and the anomalous response is not shown on the contour maps.

5.2 Site PSN 72/82

5.2.1 Site Description

Site PSN 72/82 was characterized by a clearing in the sagebrush. The terrain was flat, and small amounts of barbed wire, two 1-gallon paint cans, and two low mounds were observed. The survey area was marked in the field by four COE staking lath forming a trapezoid. HLA used lath #1253 for a grid origin and extended a 200-foot-long baseline north through lath #1252. HLA installed a rectangular survey grid at this site measuring 200 feet by 150 feet, or approximately 0.69 acre (Plate 4).

HLA obtained EM31-D data along approximately 1,600 linear feet of survey transect and MAG gradient measurements at 198 stations.

5.2.2 Results, PSN 72/82

No geophysical anomalies indicative of landfill or buried debris were identified at Site PSN 72/82. MAG gradients were generally less than 10 g/f. EM in-phase signal ranged between -100 and -140 mv and the terrain conductivity was approximately 8 mmhos/m. Small variations is response associated with the barbed wire were noted, but they are not indicative of buried material. Contour maps showing the MAG gradient, EM in-phase, and terrain conductivity responses are presented on Plate 5.

5.3 Site PSN 90

5.3.1 Site Description

PSN 90 was characterized by sagebrush clearings, disturbed topography, and abundant surface debris.

Several mounds and depressions and areas with large pieces of metal were observed. The terrain, although generally flat, had an irregular topography indicating the area had been reworked. Metal sheet piles and asphalt and concrete rubble were observed. A linear depression, possibly a drainage ditch, passed through the northeast corner of the site.

The site boundary was marked by six COE lath and formed an irregular polygon. HLA incorporated the longest straight line segment of this polygon, between lath #1154 and #1155, into a 520-foot-long baseline that formed the eastern boundary of the survey area (Plate 6). HLA installed a rectangular survey grid that measured 520 feet by 280 feet, or approximately 3.34 acres. The HLA survey grid included the COE site boundary lath and suspicious areas west of the COE-designated site boundary.

HLA obtained EM31-D data along approximately 6,440 linear feet of survey transect and MAG gradient measurements at 696 stations. In addition, a reconnaissance EM31-D survey was performed in a suspect area east of the survey grid (Plate 6).

5.3.2 Results, PSN 90

Five geophysical anomalies indicative of substantial amounts of metal were detected at Site PSN 90. Their locations are shown on Plate 6. In general, large high-amplitude geophysical anomalies were recorded in the areas of surface and partially buried metal observed in the northern portion of the site. These anomalies are designated A-1, A-2, and A-3, and are characterized by MAG gradients in excess of 300 g/f and EM in-phase responses on the order of 1,000 mv. Because of interference from abundant surface metal, any more deeply buried debris, or nearby shallowly buried debris, would not have been detected in this area. A resurvey after the surface metal is removed and initial excavations of metal should be performed to verify that additional subsurface debris is not present in this area.

Anomaly A-4 is a smaller feature in the southern portion of the survey area near grid coordinates

0+30N, 1+80E. A-4 is characterized by MAG gradients of approximately 200 g/f and an EM in-phase response of 150 mv indicative of localized shallow metal debris.

Anomaly A-5 is associated with a buried metal pipe in the eastern portion of the site (Plate 6). Using an RD-400 pipe and cable locating device manufactured by Radiodetection Corp, the pipeline was traced to a nearby water well pump shack.

A variation in MAG gradient associated with the mounded area near grid coordinate 1+40 N, 1+10 E is noted. Because of the absence of an associated anomalous EM31-D response, HLA believes this MAG gradient variation may be caused by the higher elevation at the measurement stations on the mound. This caused an localized change in the position of the magnetic instrument sensors relative to native soil and volcanic bedrock, which can be highly magnetic and strongly influence magnetic response. It is also possible that the mound contains small pieces of buried metal.

Five localized single-point MAG gradient anomalies are also noted. They are believed to be caused by small pieces of surface metal located along a survey transect.

The background MAG gradient at Site PSN 90 is generally less than 20 g/f. The background EM in-phase signal is approximately 100 mv, and the background terrain conductivity is approximately 30 mmhos/m. The relatively high background conductivity compared with other sites at Hanford North Slope, is probably due to the greater moisture and clay content of the soil at this site, which is located in a cultivated area. Contour maps showing the MAG, EM in-phase, and terrain conductivity responses are presented on Plates 7, 8, and 9, respectively.

5.4 Site Igloo-1

5.4.1 Site Description

The Igloo-1 site had a gently mounded ground surface with lineations suggesting the area had been reworked by a bulldozer. The site was sparsely vegetated by low grass. The area of investigation was marked in the field by four COE staking lath that formed a trapezoid. HLA established a 160-foot-long baseline through lath #102 and #103 and installed a rectangular survey grid that measured 160 feet by 120 feet, or approximately 0.44 acre.

HLA obtained EM31-D data along approximately 1,200 linear feet of survey transect and MAG gradient measurements at 117 stations. A reconnaissance EM31-D survey was also performed at a pit and mound east of the survey grid.

5.4.2 Results, Igloo-1

The geophysical survey coverage and results for the Igloo-1 site are shown on Plate 10. A single large and well-defined area of anomalous geophysical response measuring approximately 50 feet by 120 feet was identified. The area is characterized by MAG gradients from 100 to over 400 g/f and EM in-phase signals in excess of 2,000 mv. These responses are indicative of large amounts of metal, probably within 5 feet of the ground surface. The associated terrain conductivity anomaly is believed to be caused by the buried metal and is not indicative of changes in soil properties. Contour maps showing the MAG, EM in-phase, and terrain conductivity responses are also presented on Plate 10.

5.5 Site Igloo-2

5.5.1 Site Characteristics

The southern portion of Igloo-2 was characterized by gently mounded ground surface with lineations suggesting the area had also been reworked by a bulldozer. The ground surface dips to the southwest where it encompasses a wash that terminates into a hummocky area that also appeared reworked. The site was sparsely vegetated by low grass and a band of sagebrush. The area of investigation was marked in the field by four COE staking lath forming a trapezoid. HLA established a 310-foot-long baseline between lath #126 and #127 and installed a rectangular survey grid that measured 310 feet by 160 feet. Based on the preliminary results of the EM31-D survey, a 40- by 40-foot extension was added to the southeast corner of the grid, forming a survey area of approximately 1.16 acres.

HLA obtained EM31-D data along approximately 2,840 linear feet of survey transect and MAG gradient measurements at 272 stations.

5.5.2 Results, Igloo-2

The geophysical survey coverage and results for the Igloo-2 site are shown on Plate 11. Contour maps showing the MAG gradient, EM in-phase, and terrain conductivity responses are presented on Plate 12. A single large and well-defined area of anomalous geophysical response similar to that found at Igloo-1 was identified. This area measured approximately 70 feet by 120 feet and was characterized by MAG gradients from 100 to over 500 g/f and EM in-phase signals in excess of 2,000 mv. These responses are indicative of large amounts of metal that is probably within 5 feet of the ground surface. The associated terrain conductivity anomaly is probably caused by the buried metal and is not indicative of changes in soil properties.

5.6 Site Bridge Overview-1

5.6.1 Site Description

The Bridge Overview-1 site was characterized by sandy soil and gently sloping terrain. Wood debris and patches of glass, cinders, and small metal debris such as nails and bottle caps, were observed on the surface. The site was partially vegetated with sagebrush. The investigation area was marked by four COE lath forming a trapezoid. HLA established a 300-foot-long baseline, between lath #1261 and #1262, and installed a rectangular survey grid that measured 300 feet by 200 feet, or approximately 1.37 acres.

HLA obtained EM31-D data along approximately 3,000 linear feet of survey transect and MAG gradient measurements at 336 stations. A reconnaissance EM31-D survey was also performed to delimit the extent of two geophysical anomalies identified along the western edge of the survey grid.

5.6.2 Results, Bridge Overview-1

Four geophysical anomalies indicative of buried debris were identified at the Bridge Overview-1 site. The anomaly locations are shown on Plate 13 and contour maps showing the MAG gradient, EM in-phase, and terrain conductivity responses are presented on Plate 14.

All of the anomalies are of moderate amplitude and indicative of small metal debris probably buried within 5 feet of the ground surface. Although surface debris was observed near all anomaly locations, the four identified anomalies are believed to be indicative of buried objects. Partially buried stovepipes were removed at an area of anomalous response near grid coordinates 2+50 N, 0+90 E (Plate 13). HLA believes that similar small metal debris is buried at the four designated anomaly locations. Additional localized areas of anomalous response are apparent on the contour maps, but they are attributed to surface debris and have been disregarded.

Anomaly A-1 is near grid coordinate 1+40N, 0+80E. It is characterized by an EM31-D response with a small MAG gradient variation indicative of small but elongated masses of buried metal, possibly additional sheet metal stovepipes.

Anomalies A-2 and A-3 are along the western edge of the survey grid. They are characterized by EM31-D responses, without associated MAG gradient anomalies, indicative of nonferrous metal, or possibly more sheet metal stovepipes. Anomaly A-4 at grid coordinate 0+50 N, 1+00 E is similar in nature.

5.7 Site Bridge Overview-2

5.7.1 Site Description

The Bridge Overview-2 investigation area was marked in the field by four COE staking lath forming a trapezoid. Located in a saddle between two hills, the site slopes gently south. The ground surface was covered by low grass, and wood debris was piled near the northeast corner of the site. HLA used lath #1265 for a grid origin and extended a 200-foot-long baseline north through lath #1268. HLA installed a rectangular survey grid at this site which measured 200 feet by 100 feet, or approximately 0.46 acre (Plate 15).

HLA obtained EM31-D data along approximately 1,100 linear feet of survey transect and MAG gradient measurements at 121 stations.

5.7.2 Results, Bridge Overview-2

No geophysical anomalies were identified at the Bridge Overview-2 site. MAG gradients were generally less than 15 g/f. The EM in-phase signal ranged between -40 and -60 mv and the terrain conductivity was approximately 7 mmhos/m. Contour maps showing the MAG gradient, EM in-phase, and terrain conductivity responses are presented on Plate 15.

5.8 Site H-12-C

5.8.1 Site Description

The H-12-C site is characterized by a linear depression approximately 200 feet long, 40 feet wide, and 4 feet deep. HLA used COE lath #1191 for a grid origin and extended a 200-foot-long baseline through lath #1194. HLA installed a rectangular survey grid at this site which measured 200 feet by 40 feet. The geophysical survey transects were extended an additional 20 feet to cover the northern flank of the depression, creating a survey area measuring 200 feet by 60 feet, or approximately 0.27 acre (Plate 16).

HLA obtained EM31-D data along approximately 800 linear feet of survey transect and MAG gradient measurements at 77 stations.

5.8.2 Results, H-12-C

No geophysical anomalies were identified at Site H-12-C. MAG gradients were generally less than 10 g/f. The EM in-phase signal ranged between -160 and -180 mv and the terrain conductivity ranged between 20 and 24 mmhos/m. The higher conductivities measured near the center this site are probably due to moisture associated with the topographic depression. Contour maps showing the

MAG gradient, EM in-phase, and terrain conductivity responses are presented on Plate 16.

5.9 Site H-83-C

5.9.1 Site Description

Site H-83-C was characterized by two sagebrush clearings. The terrain is generally flat, with a raised area in the north showing partially buried sheet metal, possibly roofing material, and asphalt rubble (Plate 17). Another larger raised area, possibly a soil-covered foundation or loading dock, was noted south of the survey area. The southern raised area is approximately 100 feet wide and several hundred feet long.

Some of the COE site boundary lath were lying on the ground and possibly not in their original position, so the HLA geophysicist determined the survey area based on clearings in the sagebrush, observed surface and partially buried debris, and the site boundary lath remaining in place. HLA gridded a 350- by 200-foot area, with a 100- by 160-foot extension in the northeast, for a total survey area of approximately 1.91 acres. HLA obtained EM31-D data along approximately 4,200 linear feet of survey transect and MAG gradient measurements at 468 stations. In addition, a reconnaissance EM31-D survey was performed at the large raised area south of the survey grid and at a smaller mound east of the survey grid.

5.9.2 Results, H-83-C

The geophysical survey coverage and results for Site H-83-C are presented on Plate 17. Contour maps showing the recorded MAG gradient, EM in-phase, and terrain conductivity response are presented on Plates 18, 19, and 20, respectively. Data for the reconnaissance survey over the low mound and portion of the south revised areas are not presented on these plates. In general, a single large area of anomalous response measuring approximately 160 feet by 200 feet was identified in the eastern portion of the survey grid. The anomaly is characterized by MAG gradients ranging from approximately 70 g/f to over 1,000 g/f and EM in-phase signals greater than 1,000 mv. These responses are indicative of large amounts of metal buried within the upper 5 feet. The associated terrain conductivity anomaly is probably caused by the buried metal and is not indicative of changes in soil properties.

A buried pipeline was detected between the two raised areas. The pipeline was traced using the RD-400 pipe and cable locator, but its pathway could not be located exactly in the anomalous area because of interference from the abundant near-surface metal. The approximate underground pathway was marked in the field with spray paint and shown on Plate 17.

The reconnaissance EM31-D survey at the southern raised area indicated the presence of buried metal throughout the feature. The EM31-D response and the broad, flat nature of the raised area suggest a reinforced concrete structure, possibly a foundation or a loading dock. The reconnaissance survey at the smaller mound east of the survey area also indicated the presence of a reinforced concrete structure.

5.10 PSN 12/14

5.10.1 Site Characteristics

In general, Site PSN 12/14 was a gentle hillside, with numerous areas of irregular or disturbed terrain. This site was primarily covered with sparse to dense sagebrush, with low grass and sand in disturbed areas. With guidance from COE personnel, HLA established a 1,200-foot-long baseline along an arbitrarily determined OW line that spanned the survey area. Perpendicular survey transects were extended from this baseline. The HLA-installed survey grid measured approximately

1,200 feet east-west by approximately 700 feet north-south, or approximately 12.24 acres.

HLA obtained EM31-D data along approximately 26,500 linear feet of survey transect and MAG gradient measurements at 2,926 stations.

5.10.2 Results, PSN 12/14

Fourteen geophysical anomalies indicative of landfill deposits or buried debris were identified at Site PSN 12/14. Anomalies A-1, A-8, A-11, and A-14 are large high amplitude geophysical anomalies that were recorded in areas of observed surficial and partially buried metal. Buried debris may also be present at these anomaly locations. Anomaly A-13 was also a large high amplitude anomaly indicative of landfill deposits. Although no metal was observed at the surface, this anomaly was associated with a berm and a surface depression

Moderate amplitude anomalies indicative of landfilling were noted at A-2, A-3, A-4, A-5, A-6, A-7, A-9, A-10, and A-12. With the exception of A-2 and A-9, these anomalies are interpreted to be areas of buried metal. A-2 is a moderate amplitude conductivity anomaly not associated with in-phase or magnetic anomalies; HLA believes this anomaly to be the result of a nonmetallic source such as conductive leachate, increased soil salinity, finer grained soil, decaying buried debris, or increased moisture. Anomaly A-9 is a moderate- to low amplitude in-phase anomaly. Because this anomaly is not associated with MAG or conductivity anomalies, we interpret it to be indicative of small and probably widely dispersed buried nonferrous metal.

Generally, anomalous MAG gradients at PSN 12/14 ranged from -300 to 1,700 g/f with a background of less than 20 g/f. Anomalous EM in-phase signals ranged from -2,660 to 1,740 mv, and terrain conductivity ranged from -19 to 88 mmhos/m, with a background of approximately 15 mmhos/m. Contour maps showing the MAG, EM in-phase, and terrain conductivity responses are presented on

Plates 22 through 24.

5.11 Site PSN 01

5.11.1 Site Characteristics

Site PSN 01 was generally flat with a narrow, shallow depression extending northwest across the site. This site was primarily covered with low grass and bordered on the east and west by sparse sagebrush. The approximately rectangular study area was marked in the field by four COE survey lath. HLA used the southeast COE lath #1215 for a grid origin and extended a 140-foot-long baseline north through COE lath #1218, as shown on Plate 25. HLA installed a true rectangular survey grid at this site that measured 160 feet north-south by 90 feet east-west, or approximately 0.34 acre.

HLA obtained EM31-D data along approximately 720 linear feet of survey transect and MAG gradient measurements at 90 stations.

5.11.2 Results, PSN 01

No geophysical anomalies indicative of landfill deposits or buried debris were identified at Site PSN 01. MAG gradients were generally less than 5 g/f, although isolated values ranged from -25 to 20 g/f. The EM in-phase signal ranged from -60 to 5 mv and terrain conductivity was approximately 8 mmhos/m. The low magnitude of the isolated magnetic anomalies and the lack of associated EM anomalies suggest that the MAG anomalies are the result of minor isolated metal objects and not landfill deposits. Contour maps showing the MAG, EM in-phase, and terrain conductivity responses are presented on Plate 25

5.12 Site H-12-L-1

5.12.1 Site Characteristics

Site H-12-L-1, a rectangular topographic depression with up to 15 feet of relief, was characterized by low grasses and weeds, with more dense and vigorous vegetation near the bottom of the depression. Cultural features at this site included a small vault near the southwest corner and possible buildings remnants near the southeast corner. The survey area was marked in the field by three COE survey lath; the lath for the northwest corner was missing. The map provided for this site indicated that the original area was approximately rectangular. HLA used the southwest COE lath #1203 for a grid origin and extended a 200-foot-long baseline east through COE lath #1202, as shown on Plate 26. HLA installed a true rectangular survey grid at this site that measured 220 feet east-west by 140 feet north-south, or approximately 0.72 acre.

HLA obtained EM31-D data along approximately 1,550 linear feet of survey transect and MAG gradient measurements at 180 stations.

5.12.2 Results, H-12-L-1

No geophysical anomalies indicative of large-scale landfill deposits or buried metal debris were identified at Site H-12-L-1. However, an area of elevated terrain conductivity was measured that may be associated with soil contamination. MAG gradients were generally less than 3 g/f, but isolated values ranging from -5 to 98 g/f were observed at the small vault and possible former building site. The EM in-phase signal ranged between -46 and 26 mv and terrain conductivity ranged from 20 to 38 mmhos/m, with a background of approximately 22 mmhos/m.

A widespread 30 to 38 mmhos/m terrain conductivity anomaly was identified in the topographic depression and associated with the vigorous vegetation. Because no MAG or in-phase anomalies were associated with this conductivity anomaly, HLA interprets the anomaly to be indicative of a nonmetallic source, such as increased salinity or moisture. It is also possible that the elevated conductivity is the result of electrically conductive leachate originating from contamination.

The localized MAG anomalies near the southeast and southwest corners of the survey area are likely the effect of observed cultural features. Contour maps showing the MAG, EM in-phase, and terrain conductivity responses are presented on Plate 27.

5.13 Site H-12-L-2

5.13.1 Site Characteristics

Site H-12-L-2 was characterized by low grasses and cactus and was bordered by sagebrush to the north and south. The survey area marked in the field by four COE survey lath was approximately rectangular. HLA used the northeast COE lath #207 and extended a 120-foot-baseline through COE lath #1208. HLA projected a survey grid origin approximately 80 feet southwest of COE lath #1208 near COE lath #1205, as shown on Plate 28. HLA installed a true rectangular survey grid at this site measuring 120 feet east-west by 80 feet north-south, or approximately 0.23 acre.

HLA obtained EM31-D data along approximately 480 linear feet of survey transect and MAG gradient measurements at 63 stations.

5.13.2 Results, H-12-L-2

No geophysical anomalies indicative of landfill deposits or buried debris were identified at Site H-12-L-2. MAG gradients were generally less than 3 g/f. The EM in-phase signal ranged between -60 and 10 mv and terrain conductivity ranged from 20 to 25 mmhos/m. Contour maps showing the MAG, EM in-phase, and terrain conductivity responses are presented on Plate 28.

5.14 Site PSN 04

5.14.1 Site Characteristics

Site PSN 04 comprised four distinct survey areas identified as PSN 04 north, south, east, and west. These sites were generally flat or gently sloping Vegetation ranged from sparse grass to dense sagebrush. Localized shallow depressions and mounds indicating areas of disturbed soil were present.

At the request of CDM personnel, HLA performed a followup investigation performed to verify the locations of anomalies identified by IT Corporation in a previous geophysical investigation. IT Corporation provided geophysical survey coverage of all four survey areas, so HLA did not complete a thorough resurvey of the sites.

CDM personnel indicated six geophysical anomalies requiring further investigation. These anomalies had been marked in the field using survey lath and numbered consecutively within each area. All anomaly location lath appeared to be in place except at PSN 04 north. Therefore the investigation at PSN 04 north included a reconnaissance survey south of the road to find the most probable location of the previously identified geophysical anomaly.

HLA performed walkaround EM31-D and M-Scope traverses throughout the area of each previously identified anomaly to search for evidence of buried metal or other anomalous conditions. No digital data were recorded in these areas. Instead, the extent of any anomalous readings was marked on the ground surface with orange marking paint and also recorded on a map provided by CDM.

5.14.2 Results, PSN 04

Numerous geophysical anomalies indicative of landfill deposits or buried debris were verified and field located at Sites PSN 04, south, east, and west. In general, the areas where geophysical anomalies had been previously identified were characterized by conductivity, in-phase, and M-Scope anomalies. Typically, the anomaly limits determined by HLA were consistent with the areas staked in the field. However, localized concentrations of buried metal or conductive materials were delineated both within and slightly outside the anomaly boundaries. These are the areas HLA marked in the field with orange print.

At PSN 04 north, HLA defined an area approximately 20 feet in diameter indicative of a buried metal object. A small unmarked survey lath was found on the ground near this anomaly, but because it appeared to be outside the southeast corner of the survey area, HLA cannot be certain that it identifies the anomaly located by IT. HLA did not review IT's geophysical data for these areas and was unaware of their criteria for selecting anomaly limits. Therefore, HLA recommends that CDM include the areas marked in the field by HLA with those reported by the previous contractor.

TABLES

Table 1. Summary of Results, Ten Potential Landfill Sites (13 Survey Areas)
Hanford North Slope
Richland, Washington

Site Designation	Site Size (Acres)	Results	Remarks
H-81-R	0.66	No anomalies identified in survey grid	1 anomaly indicative of buried metal identified north of survey grid.
PSN 72/82	0.69	No anomalies identified	—
PSN 90	3.34	5 anomalies identified	3 anomalies caused by large metal objects on surface and possibly additional buried metal. 1 anomaly caused by buried pipe; additional localized buried metal detected.
Igloo-1	0.44	1 large anomaly identified	Anomaly indicative of large amounts of buried metal.
Igloo-2	1.16	1 large anomaly identified	Anomaly indicative of large amounts of buried metal.
Bridge Overview-1	1.37	4 small anomalies identified	Anomalies indicative of localized small buried metal debris; much debris on surface.
Bridge Overview-2	0.46	No anomalies identified	—
H-12-C	0.27	No anomalies identified	—
H-83-C	1.91	1 large anomaly identified in survey area	Anomaly indicative of large amounts of buried metal associated with raised area; partial anomaly detected at second raised area south of survey grid; buried pipe detected.

Table 1. Summary of Results, Ten Potential Landfill Sites (13 Survey Areas)
Hanford North Slope
Richland, Washington

Site Designation	Site Size (Acres)	Results	Remarks
PSN 12/14	12.24	14 anomalies identifed	See Table 2.
PSN 01	0.34	No anomalies identified	—
H-12-L-1	0.72	1 anomaly identified	Terrain conductivity anomaly probably caused by increased soil moisture or possibly soil contamination.
H-12-L-2	0.23	No anomalies identified	—

Table 2. Geophysical Anomaly Locations and Characteristics, PSN 12/14 Landfill
Hanford North Slope
Richland, Washington

Anomaly Designation	Survey Grid Coordinates (ft)	Anomaly Dimension (ft)	Interpretation of Subsurface Characteristics
A-1	S 2+10, W 0+80	300 x 60	Disposal trench with metal and non-metal debris; localized shallow metal nearby.
A-2	S 1+50, W 1+30	120 x 120	Change in soil characteristics, non-metallic debris; soil moisture increase or leachate.
A-3	S 3+80, W 1+40	80 x 60	Disposal cell with metal and non-metal debris; localized shallow metal nearby.
A-4	S 4+30, W 1+90	70 x 40	Disposal cell with metal and non-metal debris; localized shallow metal nearby
A-5	S 4+30, W 2+90	50 x 20	Localized metal debris.
A-6	S 5+80, W 1+10	80 x 80	Localized metal debris.
A-7	S 7+10, W 0+80	60 x 40	Localized metal debris.
A-8	S 6+80, W 2+10	150 x 80	Disposal trench with metal and non-metal debris; localized shallow metal nearby.
A-9	S 6+30, W 2+70	220 x 70	Disposal cell with metal and non-metal debris; localized shallow metal nearby.

Table 2. Geophysical Anomaly Locations and Characteristics, PSN 12/14 Landfill
Hanford North Slope
Richland, Washington

Anomaly Designation	Survey Grid Coordinates (ft)	Anomaly Dimension (ft)	Interpretation of Subsurface Characteristics
A-10	S 6+10, W 3+90	60 x 30	Localized metal debris.
A-11	S 8+10, W 4+80	200 x 50	Disposal trench with metal and non-metal debris; localized shallow metal nearby.
A-12	S 7+70, W 5+40	40 x 40	Localized metal debris.
A-13	S 7+30, W 5+60	100 x 60	Disposal trench with metal and non-metal debris; localized shallow metal nearby.
A-14	S 10+60, W 4+00	190 x 130	Disposal cell with metal and non-metal debris; localized shallow metal nearby.

PLATES

APPENDIX

GEOPHYSICAL METHODS AND EQUIPMENT

APPENDIX

This section discusses the geophysical techniques used for this survey and the parameters measured by those techniques.

Electromagnetics - EM31-D

The EM method employs a portable power source, a transmitter, and receiver coils to induce and measure an electromagnetic current in the ground. Current flowing in the transmitter coil generates a magnetic field that induces small electrical currents in the ground beneath the instrument. These currents generate secondary magnetic fields that are detected by the receiver coil. The ratio of primary to secondary field strengths is proportional to terrain conductivity and can be read directly on the EM instrument meter, which is calibrated in units of conductivity. Decaying refuse and buried metal are electrically conductive compared to native soil, and therefore produce anomalous readings in measured conductivity values.

Two components of the EM field were measured: terrain conductivity (sometimes referred to as the quadrature phase component) as expressed in millimhos per meter (mmhos/m), and the in-phase component of the EM field, expressed in millivolts (a measure of signal strength). Terrain conductivity data can be used to locate backfilled trenches or pits, provided the conductivity of the backfill material contrasts with that of the surrounding native material. The in-phase mode of the EM field is particularly sensitive to metal objects and was used to locate buried metallic debris.

A Geonics Limited Model EM31-D terrain conductivity meter, which can measure subsurface conditions to a depth of approximately 20 feet, was used in this investigation. The EM31-D was connected to a Molytek Model 221/222 portable two-channel chart recorder and an Omnidata

Polycorder Model 516 digital data logger for continuous data acquisition along the survey transects.

Electromagnetics - M-Scope

The Fisher Research Laboratory Model TW-6 M-Scope is similar in principle to the EM31-D. The unit comprises a mobile transmitter and a receiver, which are connected by a handle. The transmitter radiates an electromagnetic field that is detected by the receiver. Nearby metal objects cause distortions in the field. The receiver, which has been previously tuned in an area free of metal, detects the distortions and produces an audible signal when held within approximately 4 feet of metal objects. The M-Scope has the advantage of being sensitive to smaller pieces of buried metal than the EM31-D.

Magnetics

The magnetic technique measures the total intensity of the earth's magnetic field in units of magnetic intensity called gammas. Ferrous metal debris in a landfill creates variations (anomalies) in field intensity; the MAG instrument records these anomalies. The magnetic sensor is a vessel filled with a proton-rich source such as kerosene. The protons behave like small spinning magnets, which orient themselves to the earth's magnetic field. A reading is initiated when an electrical current is passed through a wire coil around the sensor vessel. The current generates its own magnetic field and the protons readily align themselves to the new field When the applied field is removed, the protons return to their original orientation. The returning motion (or precession) generates a small electrical signal that is related to the intensity of the earth's magnetic field at the sensor location. The intensity is a scalar measurement of the magnetic field vector independent of its orientation.

A pair of GEM Model GSM-19 proton precession magnetometers were used for this survey. One was used as a base station, and the other was deployed as a gradient magnetometer. The base station uses a single magnetic sensor; it was placed in a remote location and programmed to automatically record the earth's magnetic field intensity every 30 seconds.

The gradient magnetometer uses two magnetic sensors spaced 1 meter apart on a staff and was carried along the survey transects. This arrangement allows for simultaneous measurement of the magnetic field at the two sensor locations. The difference between the two values is converted to the vertical magnetic gradient, expressed in gammas-per-foot (g/f). As the effect of localized ferrous metal on the earth's magnetic field diminishes rapidly with distance, the gradient measurement is more sensitive to buried metal than single sensor magnetic field measurements. Moreover, the effects of diurnal magnetic drift and any regional magnetic gradient are removed by the gradient measurement approach.

DISTRIBUTION

Results of Geophysical Surveys at
Ten Potential Landfill Sites
Hanford North Slope
Richland, Washington

September 2, 1994

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QUALITY CONTROL REVIEWER

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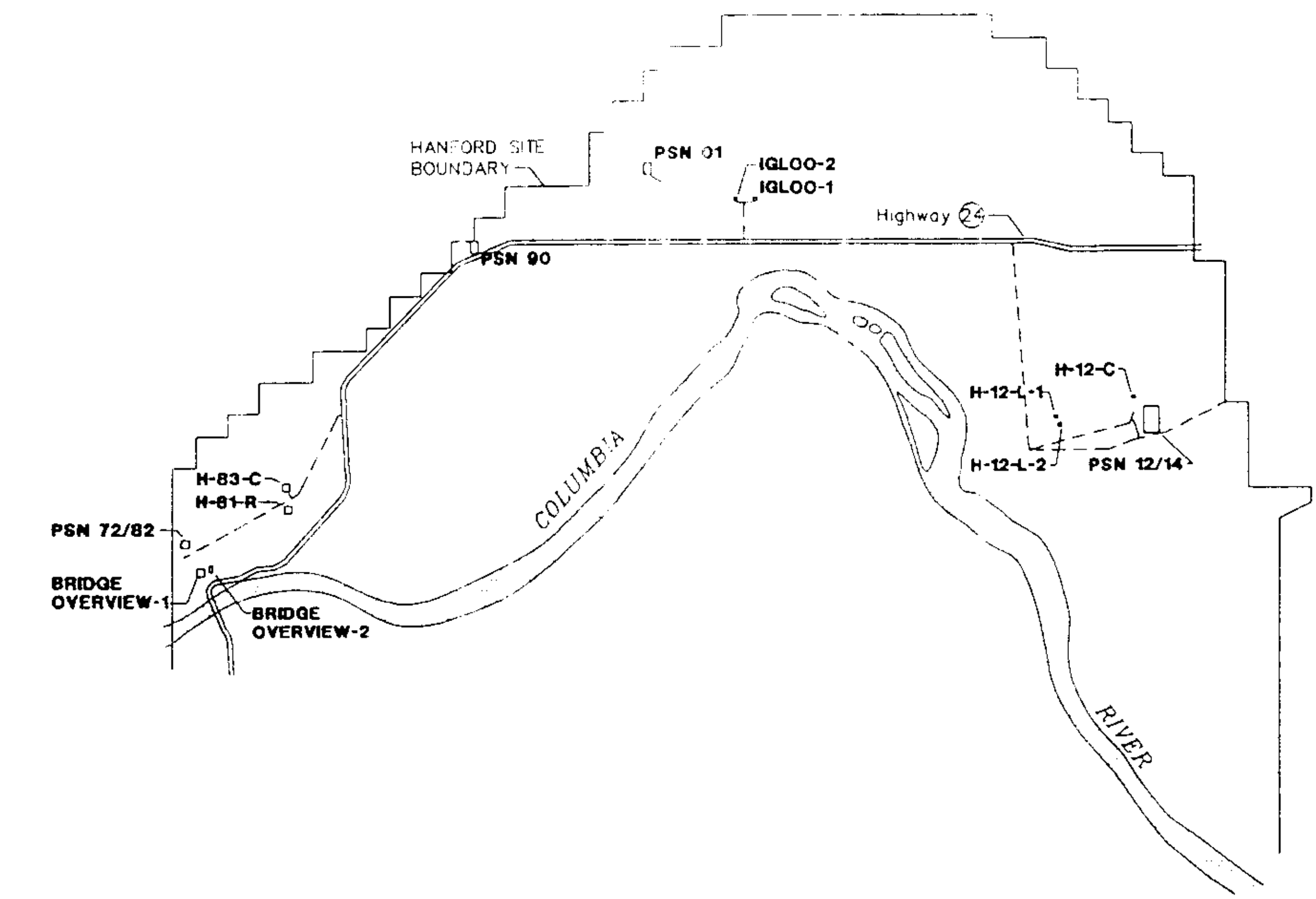
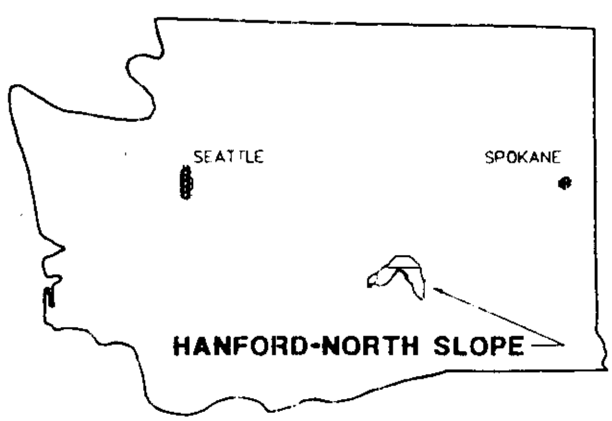
David W. Gibbs, G.P. 956
Associate Geophysicist

RWS/MJR/ld/RS067-geo



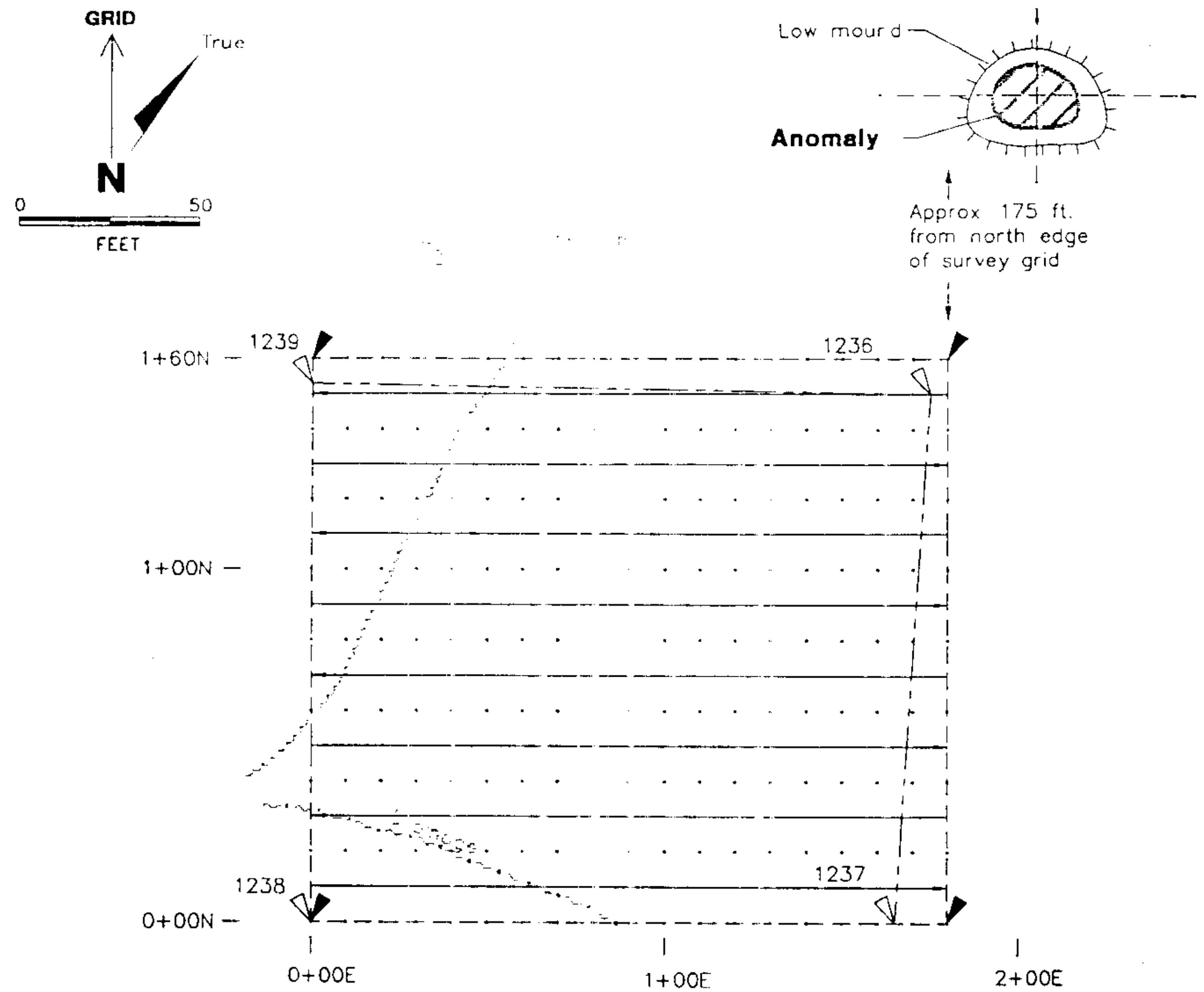


Harding Lawson Associates
Engineering and Environmental Services

Location Map
Ten Potential Landfill Sites
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969,6		8/94	



EXPLANATION

GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL

EM31-D SURVEY TRANSECT

RECONNAISSANCE EM31-D SURVEY TRANSECT (approximate location)

MAGNETIC GRADIENT MEASUREMENT STATION

1253 — COE Mark Designation Number

US ARMY COE SITE BOUNDARY AND COE INSTALLED MARKING LATH

HLA SURVEY AREA BOUNDARY AND HLA INSTALLED MARKING LATH

DRAFT

H81RCR.DWG

Harding Lawson Associates
Engineering and
Environmental Services

Geophysical Survey Coverage and Results
Site H-81-R
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

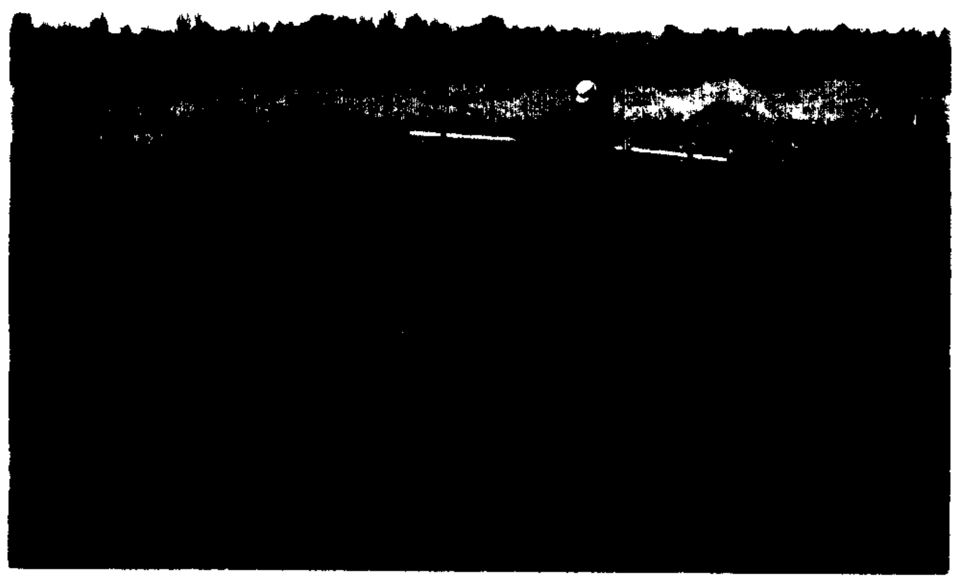
Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Site Name: Hanford North Slope, Washington

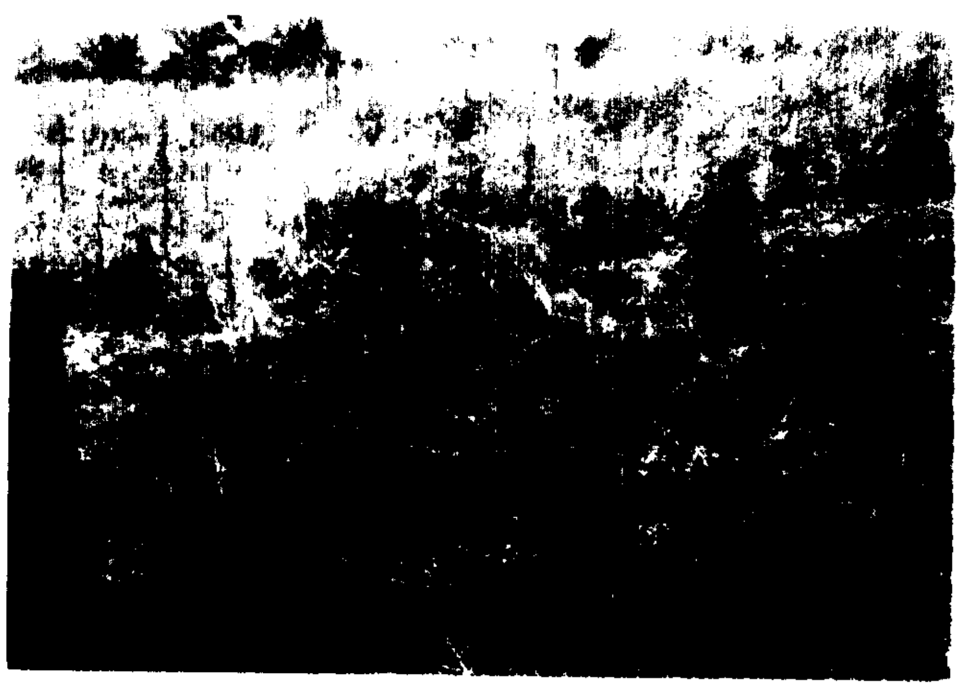
Description:

Geophysical Survey at the H-06-L West Site Using EM31-D Equipment



Description:

Small Geophysical Anomaly Marked in the Field, H-06-L West Site



Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Site Name: Hanford North Slope, Washington

Description:

Excavation of a Shallow Landfill Cell H-06-L West Site

Description:

Typical Metallic Debris Excavated from a Landfill Cell at the H-06-L West Site

Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Site Name: Hanford North Slope, Washington

Description:

Collection of a Soil Sample from a Rusted and Crushed Drum Excavated from a H-06-L West Landfill Cell

Description:

Typical Burn Pit Debris, H-06-L West Site

Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Site Name: Hanford North Slope, Washington

Description:

Rusted and Crushed Drum and Associated Soil Contaminated With Paint Chips. H-06-L West Site

Description:

Collection of a Sample of Oily Soil Recovered With a Crushed Drum, H-06-L West Site

Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

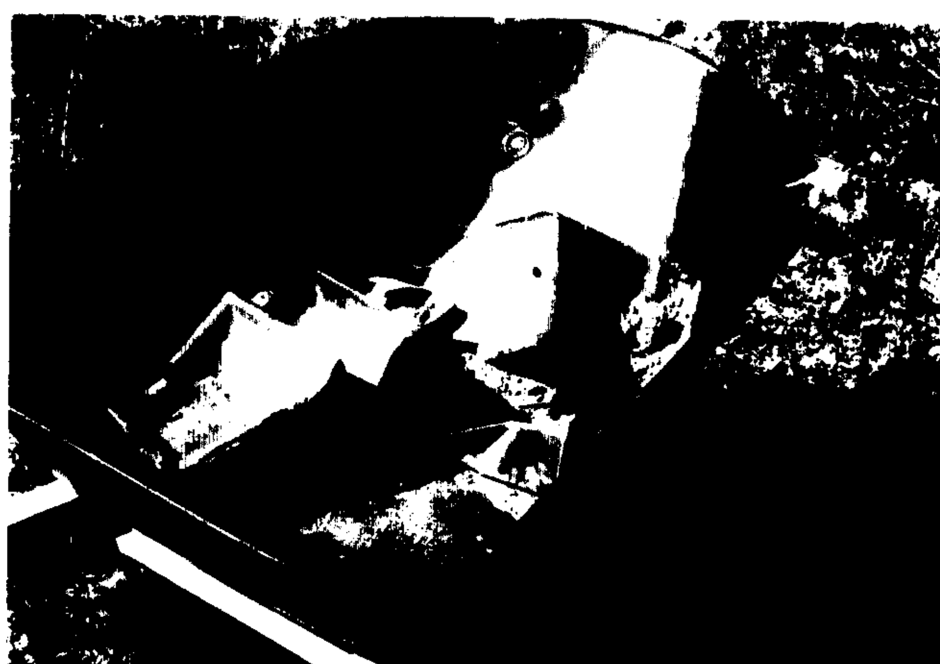
Site Name: Hanford North Slope, Washington

Description:

Rusted and Crushed Drum and Coiled Barbed Wire. H-06-L West Site

Description:

Empty Pesticide Cans Labeled as Containing Kerosene and DDT (5%). H-06-L West Site.
Note: Holes Present in the Bottom of Each Can



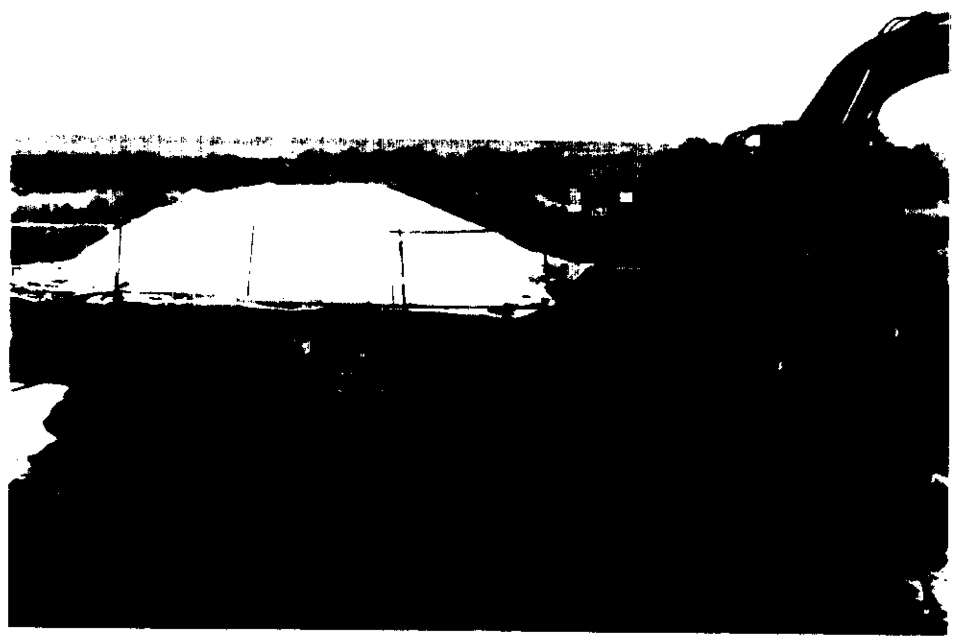
Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Site Name: Hanford North Slope, Washington

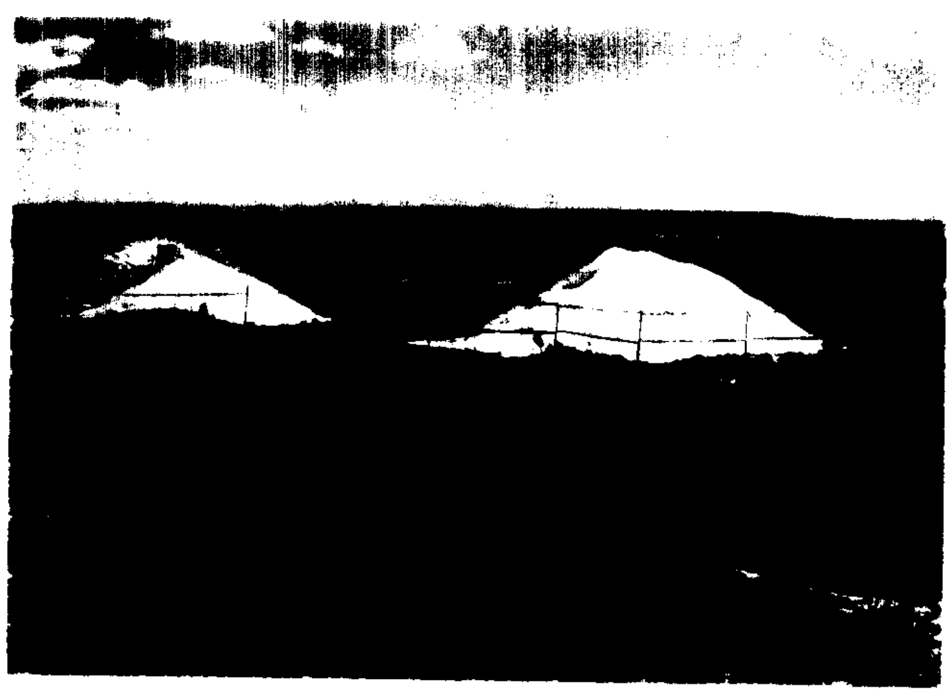
Description:

Petroleum-Contaminated Soils Staged for Offsite Disposal at the H-06-L West Site. Excavation in Foreground



Description:

Petroleum-Contaminated Soils Staged for Offsite Disposal at the H-06-L West Site



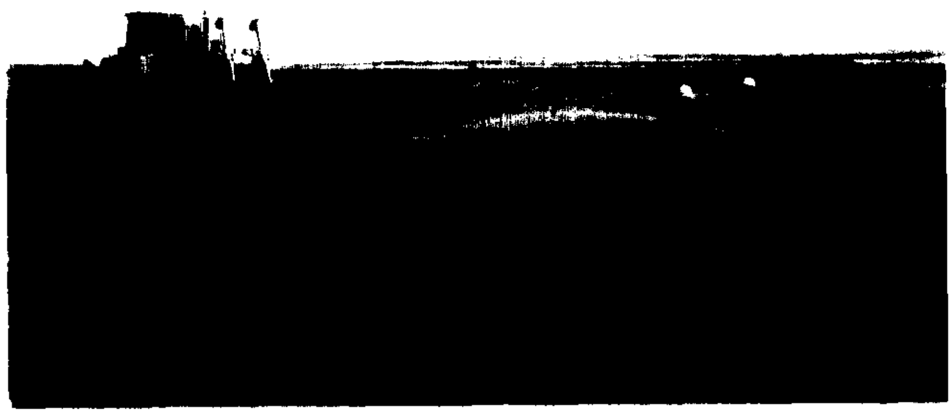
Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Site Name: Hanford North Slope, Washington

Description:

Replacing Cover Material on an Excavated Landfill Cell, H-06-L West Site



Description:

Excavation of a Burn Pit, H-06-L East

Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Site Name: Hanford North Slope, Washington

Description:

Excavation of DDT-Contaminated Soils at the H-06-L East Site

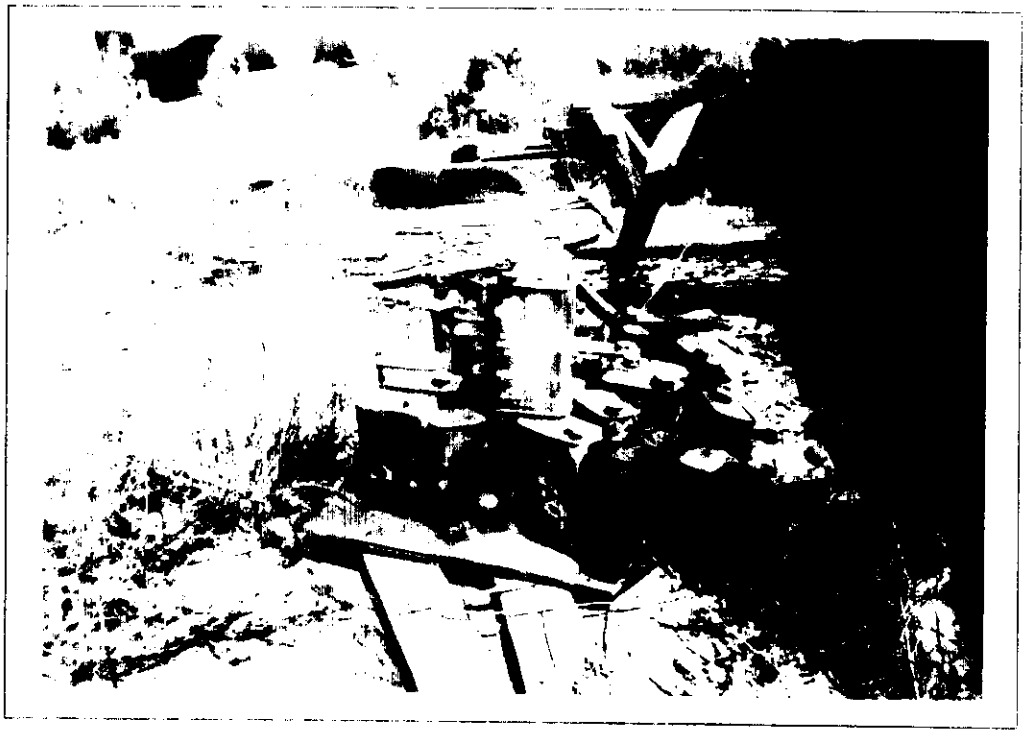
Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Site Name: Hanford North Slope, Washington

Description:

Full Lubricating Oil Cans at the H-83-L Site



Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Site Name: Hanford North Slope, Washington

Description:

Exploratory Trench Excavated Through a Shallow Anomaly at the H-83-L Site

Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Site Name: Hanford North Slope, Washington

Description:

Spent Rocket Motor Removed From a H-83-L Excavation

Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Site Name: Hanford North Slope, Washington

Description

Sampling of Petroleum-Contaminated Soils at the Vehicle Rack, PSN 90 Site

Description:

Excavation of a Sheet-Steel Structure at the PSN 90 Site

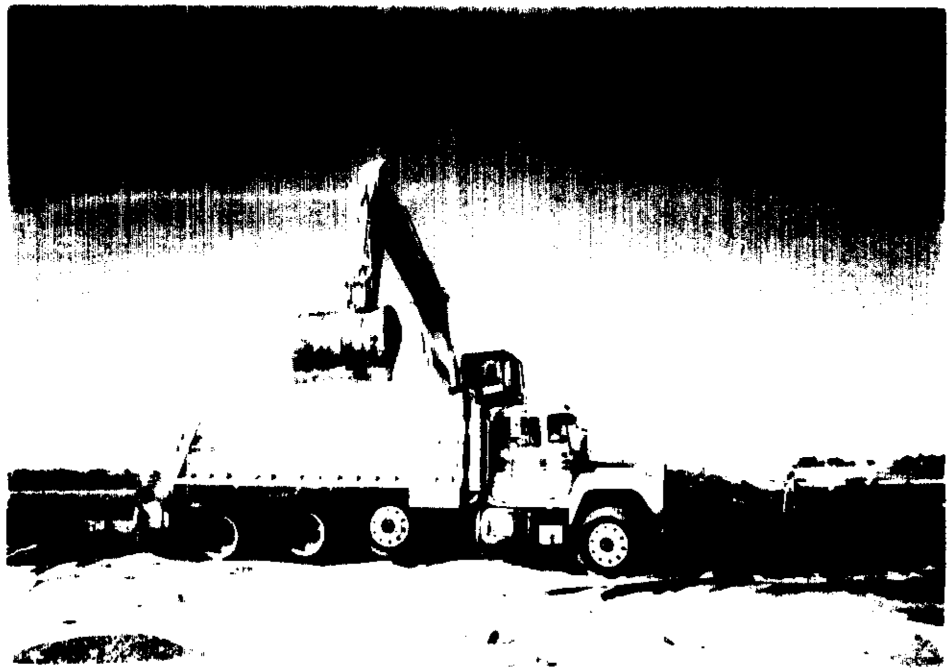
Photographic Record

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Site Name: Hanford North Slope, Washington

Description:

Loading of DDT-Contaminated Soils Onto Trucks for Transportation and Offsite Disposal, H-06-L Site



Description:

Loading of DDT-Contaminated Soils onto a Truck for Offsite Disposal, H-06-L East Site

ANALYTICAL DATA SUMMARY
BACKGROUND SOIL SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	CDM No.	94H06L(E)-BG1-01-002	94H06L(W)-BG2-01-002	94H06L(W)-BG2-02-002	94H06L(W)-BG3-01-002	94H83L-BG1-01-002	94BOV2-BG1-01-002	941214-BG1-01-002	94PSN90-BKG-01-002	94IGL-BKG-01-002	94H83C-BKG-01-002	94H83C-BKG-02-002	94PSN04(S)-BG01-01-001	94H12L-BG1-01-001
	HEIS No.	BOBSY8	BOBSZ0	BOBSZ1	BOBSZ5	BOC3B0	BOC3C0	BOC3C6	BOC3C2	BOC 3C3	BOC3C4	BOC3C5	BOC3F9	BOC3G1
	ESE No.	24	26	27	31	2	41	42	3	4	5	6	11	13
[illegible] ALPHA (NCI/KG)		9.2	--	--	--	20.7	5.5	6.3	25.4	--	--	6.5	--	--
[illegible] (NCI/KG)		17.3	--	--	21	19.2	35.1	19.7	27.8	31.4	37.7	28.1	--	--
[illegible] (MG/KG)		6.71	4.71	5.11	3.07	1.02	1.1	1.76	5.42	3.98	2.76	2.56	3.17	1.47
[illegible] (MG/KG)		120	114	117	133	62.7	34.9	74.4	136	131	93	96.1	111	54.6
[illegible]SIUM (MG/KG)		7.15	7.69	7.47	7.66	3.73	7.73	10.9	9.06	10.3	12.5	12.2	4.51	4.41
[illegible]ETONE (UG/KG)		--	--	--	--	20	--	--	--	--	--	--	--	--
[illegible] (UG/KG)		--	--	120	4500	--	--	120	220	2100	--	--	160	280
[illegible] (UG/KG)		--	--	--	--	--	--	--	--	1800	--	--	--	--
[illegible]		8.02	--	--	--	--	--	--	--	--	--	--	--	--
[illegible]		1.57	--	--	--	--	--	--	--	--	--	--	1.85	--
[illegible]		12.9	1.66	1.47	--	--	--	--	--	--	--	--	--	--

NCI/KG = Nanocuries Per Kilogram
MG/KG = Milligrams Per Kilogram
UG/KG = Micrograms Per Kilogram

ANALYTICAL DATA SUMMARY (cont'd)
BACKGROUND SOIL SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	Average of Detected Concentrations	Range of Detected Concentrations	Standard Deviation of Detected Concentrations
GROSS ALPHA (NCI/KG)	12.27	6.3-25.4	8.58
GROSS BETA (NCI/KG)	26.37	17.3-37.7	7.43
ARSENIC (MG/KG)	3.30	1.02-6.71	1.79
BARIUM (MG/KG)	98.28	34.9-136	32.56
CHROMIUM (MG/KG)	8.10	3.73-12.5	2.85
ACETONE (UG/KG)	20.00	20.00	NA
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	1071.43	120-4500	1673.59
DI-N-BUTYL PHTHALATE (UG/KG)	1800.00	1800.00	NA
DDD-4,4' (UG/KG)	8.02	8.02	NA
DDE-4,4' (UG/KG)	1.71	1.57-1.85	0.20
DDT-4,4' (UG/KG)	5.34	1.47-12.9	6.54

I/KG = Nanocuries Per Kilogram
MG/KG = Milligrams Per Kilogram
UG/KG = Micrograms Per Kilogram

ANALYTICAL DATA SUMMARY
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No.	94H06L(W)-A20-01-004	94H06L(W)-A20-02-006	94H06L(W)-A19-01-008	94H06L(W)-A19-02-007	94H06L(W)-A19-03-005	94H06L(W)-A19-04-005	94H06L(W)-A17-01-003	94H06L(W)-A16-01-002
					HEIS No.	BOBSW3	BOBSW4	BOBSW5	BOBSW6	BOBSW7	BOBSW8	BOBSW9	BOBSX0
					ESE No.	1	2	3	4	5	6	7	8
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		20.9	--	--	18.7	11	--	--	--
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		29.2	--	--	16.4	17.2	27.7	--	--
ARSENIC (MG/KG)	20	1.43	60	3.25		2.26	3.01	3.21	2.86	3.75	3.52	41.6	4.32
SELENIUM (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	--	--
MERCURY (MG/KG)	1	NA	24	--		--	--	--	--	--	--	0.116	--
BARIUM (MG/KG)	NA	NA	5600	301.44		80	61.9	87.4	96.2	100	107	91.9	90.9
CADMIUM (MG/KG)	2	0.164	8	--		--	--	--	1.38	--	--	--	0.671
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		6.4	6.21	9.02	7.66	7.45	5.56	14.5	25
LEAD (MG/KG)	250	NA	NA	--		--	--	--	61.8	--	11.6	--	217
SILVER (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	--	--
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	--	--	--	--	--	--	--
METHYLENE_CHLORIDE (UG/KG)	500	NA	NA	--		7	7.1	--	--	--	--	--	--
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	--	--	--	--	78	--
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	--	--	--	--	--	--
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--	--	--	--	--	5.2	--	--
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	--	--	--	--	--	--
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--		--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		--	--	--	--	--	--	--	--
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
DI-N-BUTYL_PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	--	--	--	--	--	--
DIETHYL_PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	--	--	--	--	--	--
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	--	--	--	--	--	--
DI-N-OCTYL_PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	--	--	--	--	--	--
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	--	--	--	--	--	--
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	--	--	--	--	--	--
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	--	--	--	--	--	--
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	--	--	--	--	--
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	--	--	--	--	--	--
CHLORDANE (UG/KG)	NA	769	4800	--		--	--	--	--	--	--	--	--
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		62.7	--	--	54.7		--	--	--
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		298		--	37.4	74	85.5	83.1	34.4
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		125	--	--	177	64.6	78.6	879	39
DIELDRIN (UG/KG)	NA	62.5	4000	--		--	--	--	--	--	--	--	--
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	4.52	--	--	--	--
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	--	--	--	--	--
ENDRIN_ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	1.92	--	--	--	--
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	344	--	--	--	--
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	344	--	--	--	--
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
2-BUTANONE_(MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	--	--	--	--	--	--
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ENDRIN_KETONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	--	--	--	--	--
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--		--	--	--	5850	--	--	85900	3610
HEAVY OILS (MG/KG)	200	NA	NA	--		--	--	--	--	--	--	--	--

ANALYTICAL DATA SUMMARY (cont'd)
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No.	94H06L(W)-A16-02-003	94H06L(W)-A07-01-001	94H06L(W)-A07-02-005	94H06L(W)-A05-01-004	94H06L(W)-A05-02-003	94H06L(W)-A05-03-004	94H06L(W)-A04-01-005	94H06L(W)-A04-02-012
					HEIS No.	BOBSX1	BOBSX2	BOBSX3	BOBSX5	BOBSX7	BOBSX8	BOBSX9	BOBSY0
					ESE No.	9	10	11	12	13	14	15	16
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		--	18.5	27	11.8	29.2	43.6	45.8	--
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		--	12.6	22.8	17	37.6	8.1	27	--
ARSENIC (MG/KG)	20	1.43	60	3.25		8.18	3.68	8.2	2.54	1.89	4.68	5.02	3.96
SELENIUM (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	--	--
MERCURY (MG/KG)	1	NA	24	--		--	--	--	--	--	--	--	--
BARIUM (MG/KG)	NA	NA	5600	301.44		105	96	147	82.3	82.9	125	112	101
CADMIUM (MG/KG)	2	0.164	8	--		--	--	--	--	--	--	--	--
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		10.7	11.3	18.2	9.22	14.6	7.67	10.4	9.2
LEAD (MG/KG)	250	NA	NA	--		--	39.6	11.9		111	--	15.6	12
SILVER (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	--	--
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	--	--	--	--	--	--	11
METHYLENE_CHLORIDE (UG/KG)	500	NA	NA	--		--	--	--	--	--	--	--	--
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	--	--	--	--	--	--
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	--	--	9.5	--	--	--
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--							
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	--	--	--	--	--	--
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA					--	--			--	--
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--		--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		--	--	--	--	--	--	--	160
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	380	--
DI-N-BUTYL_PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	--	--	--	--	--	--
DIETHYL_PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	--	--	--	--	--	--
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	--	--	--	--	--	--
DI-N-OCTYL_PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	--	--	--	--	--	--
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	3600	--
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	--	--	--	--	960	--
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	--	--	--	--	--	--
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	570	--
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	--	--	--	--	--	--
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	--	--	--	--	--
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	--	--	--	--	--	--
CHLORDANE (UG/KG)	NA	769	4800	--		--	37700	--	--	--	--	--	--
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		--	42700	--	--	--	--	31	115
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		1.59	3330	--	3.18	5.23	--	8.92	79
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		--	254000	--	6.72	5.54	--	67.8	284
DIELDRIN (UG/KG)	NA	62.5	4000	--		--	--	--	--	--	--	--	--
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	--	--	--	--	--
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	--	--	--	--	--
ENDRIN_ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
2-BUTANONE_(MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	--	--	--	--	--	--
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ENDRIN_KETONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	--	--	--	--	--
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--		--	125	--	--	128	--	2040	381
HEAVY OILS (MG/KG)	200	NA	NA	--		--	--	--	--	--	--	--	--

ANALYTICAL DATA SUMMARY (cont'd)
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No.	94H06L(E)-A14-01-001	94H06L(E)-A14-02-001	94H06L(E)-A12-01-010	94H06L(E)-A12-02-012	94H06L(B)-A11-01-007	94H06L(E)-A01-01-010	94H06L(E)-CS1-01-000	94H06L(E)-SV1-01-001
					HEIS No.	BOBSY1	BOBSY2	BOBSY3	BOBSY4	BOBSY5	BOBSY6	BOBSY7	BOBSY9
					ESE No.	17	18	19	20	21	22	23	25
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		14	--	--	--	11.8	2	24.3	10.9
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		25.5	--	--	23.1	21.9	35	24.5	25.9
ARSENIC (MG/KG)	20	1.43	60	3.25		6.88	6.98	5.84	6.94	7.67	8.12	4.87	3.89
SELENIUM (MG/KG)	NA	NA	400	--		--	--	--	--	--	0.514	--	--
MERCURY (MG/KG)	1	NA	24	--		--	--	--	--	--	0.124	--	
BARIUM (MG/KG)	NA	NA	5600	301.44		105	111	119	145	120	119	96.2	73.2
CADMIUM (MG/KG)	2	0.164	8	--		--	--	--	--	--	--	--	--
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		14.1	14.9	13.8	15.6	19.1	15.4	11.3	8.15
LEAD (MG/KG)	250	NA	NA	--		10.4	--	36	13.8	--	11.2	--	27.2
SILVER (MG/KG)	NA	NA	400	--		--	--	1.05	--	--	--	--	--
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	--	--	--	--	--	--	--
METHYLENE CHLORIDE (UG/KG)	500	NA	NA	--		--	--	--	--	--	--	--	--
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	--	--	--	--	--	--
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	--	--	--	--	--	--
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--	--	--	--	--	--	--	--
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	--	--	--	--	--	--
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--		--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		--	--	--	--	--	--	--	--
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
DI-N-BUTYL PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	--	--	--	--	--	--
DIETHYL PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	--	--	--	--	--	--
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	--	--	--	--	--	--
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	77000	--	--
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	--	--	--	3200	--	--
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	--	--	--	--	--	--
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	16000	--	--
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	--	--	--	5400	--	--
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	--	--	--	--	--
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	5.38	--	--	--	--	--
CHLORDANE (UG/KG)	NA	769	4800	--		--	--	--	--	--	--	--	--
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		3790	1630	2780	--	--	786000	--	597
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		2130	1870	3650	146	--	44400	--	1660
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		11600	5600	5910	167	--	2080000	--	806
DIELDRIN (UG/KG)	NA	62.5	4000	--		--	--	64.3	3.53	--	--	--	--
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	--	--	--	--	--
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	--	--	--	--	--
ENDRIN ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
2-BUTANONE (MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	--	--	--	--	--	--
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ENDRIN KETONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	--	--	--	--	--
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--		--	--	165000	--	43.2	4920	--	--
HEAVY OILS (MG/KG)	200	NA	NA	--		--	--	--	--	--	--	--	--

ANALYTICAL DATA SUMMARY (cont'd)
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No.	94H06L(W)-A04-03-020	94H06L(W)-A04-04-008	94H06L(W)-SV2-01-001	94H06L(W)-WC1-01-000	94H06L(W)-WC2-01-000	94H06L(E)-A01-02-005	94H06L(E)-A01-03-005	94H06L(E)-A01-01-014
					HEIS No.	BOBSZ2	BOBSZ3	BOBSZ4	BOBSZ7	BOBSZ8	BOBT00	BOBT01	BOBT02
					ESE No.	28	29	30	32	33	34	35	36
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		--	2.8	--	--	4.2	25.4	--	22.9
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		31.8	26.6	--	--	10.4	16	21.2	34.1
ARSENIC (MG/KG)	20	1.43	60	3.25		1.44	4	1.64	3.64	1.82	5.42	5.54	7.97
SELENIUM (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	0.34	--
MERCURY (MG/KG)	1	NA	24	--		--	--	--	--	--	--	--	--
BARIUM (MG/KG)	NA	NA	5600	301.44		79.9	109	87.9	142	171	125	107	151
CADMIUM (MG/KG)	2	0.164	8	--		--	--	--	1.55	1.77	--	--	--
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		10.3	10.2	6.44	9.42	56.4	14.9	16	20.3
LEAD (MG/KG)	250	NA	NA	--		--	--	--	1140	1810	24.5	23.6	13.9
SILVER (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	--	--
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	--	--	--	--	--	--	--
METHYLENE CHLORIDE (UG/KG)	500	NA	NA	--		--	--	--	--	--	--	--	--
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	--	--	--	--	--	--
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	--	--	--	--	--	--
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--	--	--	--	220	--	--	--
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	--	9700	--	--	220	--
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	--	14000	--	--	--	--
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	--	8300	--	--	--	--
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	6800	--	--	--	--
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	2300	--	--	--	--
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--		--	--	--	5300	--	--	--	--
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--		--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		--	--	--	--	1400	--	--	--
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	--	8600	--	--	--	--
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	--	8500	--	--	--	--
DI-N-BUTYL PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	--	--	530	--	--	--
DIETHYL PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	--	--	--	--	--	--
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	--	--	--	--	--	--
DI-N-OCTYL PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	--	--	1600	--	--	--
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	24000	--	--	--	--
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	14000	--	--	--	--
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--	--	12000	140	3800	2900	--
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	--	8000	250	--	--	--
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	--	--	--	--	--	--
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	--	57000	--	2700	2500	--
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	--	18000	--	750	850	
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	--	--	52.7	54.9	--
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	--	--	--	--	--	--
CHLORDANE (UG/KG)	NA	769	4800	--		--	--	--	--	--	--	--	--
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		--	--		150	15.1	269000	276000	4.78
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		--	--	37.2	422	25	22100	28000	16.6
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		--	--	14.5	356	161	695000	611000	184
DIELDRIN (UG/KG)	NA	62.5	4000	--		--	--	--	--	--	1980	2630	8.34
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	--	--	--	--	--
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	--	--	--	--	--
ENDRIN ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
2-BUTANONE (MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	--	--	--	--	--	--
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ENDRIN KETONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	--	--	--	--	--
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--		--	82		255	57.2	437	428	
HEAVY OILS (MG/KG)	200	NA	NA	--		--	--	--	--	--	--	--	--

ANALYTICAL DA... SUMMARY (cont'd)
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No.	94H06L(E)-A01-05-012	94H06L(E)-A01-06-010	94H06L(E)-A01-07-008	94H06L(E)-A01-08-011	94H06L(E)-A01-09-011	94H06L(E)-A01-10-011	94H06L(E)-A01-11-012	94H06L(E)-A01-12-012
					HEIS No.	BOBT03	BOBT04	BOBT06	BOBT07	BOBT08	BOBT09	BOBT10	BOBT11
					ESE No.	37	38	39	40	41	42	43	44
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		--	21.9	0	52	15.4	0	0	0
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		18.9	23.3	19.4	24.4	30.9	26.8	21.3	31.1
ARSENIC (MG/KG)	20	1.43	60	3.25		7.75	7.42	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
SELENIUM (MG/KG)	NA	NA	400	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
MERCURY (MG/KG)	1	NA	24	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BARIUM (MG/KG)	NA	NA	5600	301.44		139	131	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
CADMIUM (MG/KG)	2	0.164	8	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		21.3	17	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
LEAD (MG/KG)	250	NA	NA	--		12.1	10.6	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
SILVER (MG/KG)	NA	NA	400	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
METHYLENE CHLORIDE (UG/KG)	500	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA					NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--			--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--			--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
DI-N-BUTYL PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
DIETHYL PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
DI-N-OCTYL PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	--	--	--	--	--
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	--	--	--	--	--	--
CHLORDANE (UG/KG)	NA	769	4800	--		--	--	--	--	--	--	--	--
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		--	--	148	--	8.81	11	2.87	5.92
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		--	0.862	210	--	1.09	7.92	2.81	6.84
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		4.31	7.16	2230	14.9	23.5	302	254	121
DIELDRIN (UG/KG)	NA	62.5	4000	--		--	0.856	164	--	--	4.45	2.22	6.95
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	--	--	--	--	--
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	--	--	--	--	--
ENDRIN ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
2-BUTANONE (MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ENDRIN KETONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	--	--	--	--	--
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--				NRQ	NRQ	NRQ	NRQ	NRQ	NRQ
HEAVY OILS (MG/KG)	200	NA	NA	--		--	--	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ

ANALYTICAL DATA SUMMARY (cont'd)
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No.	94H83L-A06-01-001	94H83L-A06-02-002	94H83L-A06-03-002	94H83L-CS2-02-000	94H83L-A03-01-005	94PSN90-VR-01-003	94PSN90-VR-02-001	94PSN04-A1/4-004
					HEIS No.	BOC399	BOC3B1	BOC3B2	BOC3B3	BOC3B5	BOC3B8	BOC3B9	BOC3F8
					ESE No.	1	3	4	5	6	1	2	10
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		20.6	17.4	9.2	0	0.9	6.3	2	20.4
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		20.8	19.1	19.4	18.4	16.7	18.4	16.3	17.1
ARSENIC (MG/KG)	20	1.43	60	3.25		0.978	1.16	1	2.12	1.15	4.52	2.41	9.24
SELENIUM (MG/KG)	NA	NA	400	--		--	--	0.271	--	--	--	--	--
MERCURY (MG/KG)	1	NA	24	--		--	--	--	--	--	--	--	--
BARIUM (MG/KG)	NA	NA	5600	301.44		70.1	71.2	77.6	54.8	61.1	116	79.4	71.3
CADMIUM (MG/KG)	2	0.164	8	--		--	--	--	--	--	--	--	--
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		5.88	4.71	5.16	3.53	6.13	7.99	19	10.7
LEAD (MG/KG)	250	NA	NA	--		11.6	--	--	--	--	--	70.9	--
SILVER (MG/KG)	NA	NA	400	--		--	--	--	--	--	--	--	--
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	17	24	--	95	--	--	--
METHYLENE_CHLORIDE (UG/KG)	500	NA	NA	--		--	--	--	--	--	--	--	--
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	--	--	--	--	--	--
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	--	--	--	--	--	--
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--	--	--	--	--	--	--	--
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	--	--	--	--	--	--
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA			--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--		--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		--	--	--	--	--	--	--	--
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	--	--	--	--	--	--
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
DI-N-BUTYL_PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	--	--	--	--	--	--
DIETHYL_PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	--	--	--	--	--	--
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	--	--	--	--	3000	--
DI-N-OCTYL_PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	--	--	--	--	--	--
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	--	--	--	--	--	--
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	--	--	--	--	--	--
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	--	--	--	--	--	--
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	--	--	--	--	--
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	--	--	--	--	5.63	--
CHLORDANE (UG/KG)	NA	769	4800	--		--	--	--	--	--	--	--	--
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		--	--	--	--	--	--	41	--
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		--	--	--	--	--	--	80.3	3.8
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		--	--	--	--	--	--	490	3.63
DIELDRIN (UG/KG)	NA	62.5	4000	--		--	--	--	--	--	--	3.22	
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	--	--	--	--	--
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	--	--	--	--	--
ENDRIN_ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	--	--	--	--	--
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	--	--	13	--	--	--
2-BUTANONE_(MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	--	--	35	--	--	--
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
ENDRIN_KETONE (UG/KG)	NA	NA	NA	--		--	--	--	--	--	--	--	--
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	--	--	--	--	--
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--		14900	--	--	--	168000	--	--	--
HEAVY_OILS (MG/KG)	200	NA	NA	--		11400	--	--	--	10200	--	--	--

ANALYTICAL DATA SUMMARY (cont'd)
SOIL AND WASTE CHARACTERIZATION SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND	MTCA Method A	MTCA Method B Carc.	MTCA Method B Non-Carc.	Average of Background Detections	CDM No. / HEIS No. / ESE No.	94PSN04(S)-BG01-01-001 / BOC3F9 / 11	94PSN04(S)-A04/05-003 / BOC3G0 / 12	94H12L-BG1-01-001 / BOC3G1 / 13	941214-WC1-01-000 / BOC3C7 / 43	94PSN04-DS001-02 / / 100
GROSS ALPHA (NCI/KG)	NA	NA	NA	NRQ		--	--	--	0	--
GROSS BETA (NCI/KG)	NA	NA	NA	NRQ		--	--	--	24.7	--
ARSENIC (MG/KG)	20	1.43	60	3.25		3.17	4.24	1.47	1.88	NRQ
SELENIUM (MG/KG)	NA	NA	400	--		--	--	--	--	NRQ
MERCURY (MG/KG)	1	NA	24	--		--	--	--	--	NRQ
BARIUM (MG/KG)	NA	NA	5600	301.44		111	84.7	54.6	219	NRQ
CADMIUM (MG/KG)	2	0.164	8	--		--	--	--	--	NRQ
CHROMIUM (MG/KG)	100	NA	400(Cr VI)	8.01		4.51	4.97	4.41	9.72	NRQ
LEAD (MG/KG)	250	NA	NA	--		--	--	--	11.8	NRQ
SILVER (MG/KG)	NA	NA	400	--		--	--	--	--	NRQ
ACETONE (UG/KG)	NA	NA	8.0E+06	6.29		--	--	--	17	NRQ
METHYLENE CHLORIDE (UG/KG)	500	NA	NA	--		--	--	--	--	NRQ
METHYLISOBUTYLKETONE (UG/KG)	NA	NA	4.0E+06	--		--	--	--	--	NRQ
1-1-2-TRICHLOROETHANE (UG/KG)	NA	17500	3.2E+05	--		--	--	--	--	NRQ
XYLENE-TOTAL (UG/KG)	20000	NA	NA	--		--	--	--	--	NRQ
ACENAPHTHENE (UG/KG)	NA	NA	4.8E+06	--		--	--	--	--	--
ACENAPHTHYLENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--
ANTHRACENE (UG/KG)	NA	NA	2.4E+07	--		--	--	--	--	--
BENZO(A)ANTHRACENE (UG/KG)	NA	137	NA	--		--	--	--	--	--
BENZO(B)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--
BENZO(K)FLUORANTHENE (UG/KG)	NA	137	NA	--		--	--	--	--	--
BENZO(A)PYRENE (UG/KG)	NA	137	NA	--		--	--	--	--	--
BUTYLBENZYLPHTHALATE (UG/KG)	NA	NA	1.6E+07	--		--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE (UG/KG)	NA	71400	1.6E+06	1072.14		160	--	280	--	--
CHRYSENE (UG/KG)	NA	137	NA	--		--	--	--	--	--
DIBENZOFURAN (UG/KG)	NA	NA	NA	--		--	--	--	--	--
DI-N-BUTYL PHTHALATE (UG/KG)	NA	NA	8.0E+06	945.43		--	--	--	--	--
DIETHYL PHTHALATE (UG/KG)	NA	NA	6.4E+07	47.36		--	--	--	--	
2-4-DINITROTOLUENE (UG/KG)	NA	NA	1.6E+05	--		--	--	--	--	--
DI-N-OCTYL PHTHALATE (UG/KG)	NA	NA	1.6E+06	--		--	--	--	--	--
FLUORANTHENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--
FLUORENE (UG/KG)	NA	NA	3.2E+06	--		--	--	--	--	--
2-METHYLNAPHTHALENE (UG/KG)	NA	NA	NA	--		--	--			64000
NAPHTHALENE (UG/KG)	NA	NA	3.2E+05	--		--	--	--	--	15000
N-NITROSODIPHEAMINE (UG/KG)	NA	NA	NA	--		--	--	--	--	--
PENTACHLOROPHENOL (UG/KG)	NA	8330	2.4E+06	--		--	--	--	--	--
PHENANTHRENE (UG/KG)	NA	NA	NA	--		--	--	--	--	--
PYRENE (UG/KG)	NA	NA	2.4E+06	--		--	--	--	--	--
ALDRIN (UG/KG)	NA	58.8	2400	--		--	--	--	6.35	NRQ
BHC-G (LINDANE) (UG/KG)	1000	769	24000	--		--	--	--	--	NRQ
CHLORDANE (UG/KG)	NA	769	4800	--		--	--	--	--	NRQ
DDD-4,4' (UG/KG)	NA	4170	NA	1.46		--	--	--	--	NRQ
DDE-4,4' (UG/KG)	NA	2940	NA	0.55		1.85	--	--	21.3	NRQ
DDT-4,4' (UG/KG)	1000	2940	4.0E+04	1.42		--	--	--	6.37	NRQ
DIELDRIN (UG/KG)	NA	62.5	4000	--					--	NRQ
ENDOSULFAN-B (UG/KG)	NA	NA	NA	0.4		--	--	--	--	NRQ
ENDRIN (UG/KG)	NA	NA	24000	--		--	--	--	194	NRQ
ENDRIN ALDEHYDE (UG/KG)	NA	NA	NA	--		--	--	--	--	NRQ
METHOXYCHLOR (UG/KG)	NA	NA	NA	--		--	--	--	--	NRQ
PCB-1248 (UG/KG)	1000	130	NA	--		--	--	--	--	NRQ
PCB-1254 (UG/KG)	1000	130	NA	--		--	--	--	--	NRQ
2-HEXANONE (UG/KG)	NA	NA	NA	--		--	--	--	--	NRQ
2-BUTANONE (MEK) (UG/KG)	NA	NA	4.8E+07	--		--	--	--	--	NRQ
ALPHA-BHC (UG/KG)	NA	NA	NA	--		--	--	--	2.52	NRQ
ENDRIN KETONE (UG/KG)	NA	NA	NA	--		--	--	--	39.6	NRQ
HEPTACHLOR (UG/KG)	NA	222	40000	--		--	--	--	26	NRQ
HYDROCARBONS-PETROL (MG/KG)	200	NA	NA	--		--	--	--	68500	NRQ
HEAVY OILS (MG/KG)	200	NA	NA	--		--	--	--	35100	NRQ

NRQ = Not Requested
NA - Not Applicable
NCI/KG = Nanocuries Per Kilogram
MG/KG = Milligrams Per Kilogram
UG/KG = Micrograms Per Kilogram
[shaded box] - Value exceeds most restrictive MTCA Standard shown

ANALYTICAL DATA SUMMARY
AQUEOUS SAMPLES
HANFORD NORTH SLOPE, WASHINGTON

COMPOUND / CDM No.	94H06L(W)-A05-01-EB1	94H06L(W)-A05-01-TB1	94PSN04(W)-A05/06-01-EB1	94H06L(W)-BG3-01-TB2	93H83L-A03-01-TB1	94H06L(W)-SV2-01-EB2	94H06L(E)-WW1-01-000	94H06L(E)-WW2-02-000	94H06L(E)-A01-09-EB3	94H83L-A06-02-EB1	94PSN90-VR-01-EB1
HEIS No.	BOBSX4	BOBSX6	BOC3G4	BOBSZ6	BOC3B6	BOBSZ9	BOBT05	BOB398	BOBT12	BOC3B4	BOC3C1
BSE No.	1	2	3	3	10	11	13	14	21	1	3
ARSENIC-TOTAL (UG/L)	--	--	--	--	--	--	3.9	--	--	--	--
SELENIUM-TOTAL (UG/L)	--	--	--	--	--	--	--	--	--	--	--
BARIUM-TOTAL (UG/L)	--	--	--	--	--	--	87.2	--	--	--	--
CHROMIUM-TOTAL (UG/L)	--	--	--	--	--	--	19.5	--	--	--	--
ACETONE (UG/L)	--	--	--	--	--	--	--		--	--	22
BUTYLBENZYLPHTHALATE (UG/L)	--	--	--	--	--	--	--	--	--		
BIS(2-ETHYLHEXYL)PHTHALATE (UG/L)	2.2	--	2.5	--	--	--	--	--	--	5.1	--
DIETHYLPHTHALATE (UG/L)	--	--	--	--	--	--			--	--	--
PHENOL (UG/L)	--	--	--	--				--	--	--	--
BENZYL ALCOHOL (UG/L)	--	--	--	--	--	--	--	--	--	--	--
DDD-4,4' (UG/L)	--	--	--	--	--	--	--	0.041	--	--	--
DDE-4,4' (UG/L)	--	--	--	--	--	--	--	0.019	--	--	--
DDT-4,4' (UG/L)	--	--	--		--	--	--	0.581	--	--	--
DIELDRIN (UG/L)	--	--	--	--	--	--	--	0.018	--	--	--
ENDRIN ALDEHYDE (UG/L)	--	--	--	--	--	--	--	--	--	--	--
HYDROCARBONS-PETRO (TRPH) (MG/L)	--	--	--	--	--	--	4.21	--	--	--	--

UG/L = Micrograms Per Liter
MG/L = Milligrams Per Liter
TRPH = Total Recoverable Petroleum Hydrocarbons

NORTH SLOPE WASTE INVENTORY

Site	Drum Number	Accumulation Start Date	Contents	Associated Sample	HEIS No.	Waste Disposition
H-06-L West	COE-94-WM002	April 19, 1994	Petroleum-contaminated soil and debris.	94H06L(W)-A19-02-007 94H06L(W)-A17-01-003 94H06L(W)-A16-01-002 94H06L(W)-A05-02-003	BOBSW6 BOBSW9 BOBSX0 BOBSX7	1
	COE-94-WM003	April 19, 1994	Petroeum-contaminated soil and debris.	94H06L(W)-A19-02-007 94H06L(W)-A17-01-003 94H06L(W)-A16-01-002 94H06L(W)-A05-02-003	BOBSW6 BOBSW9 BOBSX0 BOBSX7	1
	COE-94-WM004	April 22, 1994	Insecticide cans and DDT/ chlordane-contaminated soil.	94H06L(W)-A07-01-001 94H06L(E)-A14-01-001	BOBSX2 BOBSY1	1
	COE-94-WM005	April 21, 1994	Paint waste (dried paint and soils).	94H06L(W)-WC2-01-000	BOBSZ8	1
	COE-94-WW001	April 19, 1994	Wastewater from decontamination activities.	94H06L(E)-WW1-01-000 94H06L(E)-WW2-02-000	BOBTO5	2
	NA	April 25, 1994	200 cubic yards of petroleum hydrocarbon contaminated soil and debris.	94H06L(W)-A04-01-005 94H06L(W)-A04-02-012 94H06L(W)-A04-04-008	BOBSX9 BOBSY0 BOBSZ3	8
H-06-L East3	COE-94-PPE01	May 11, 1994	Used PPE from excavation of DDT-contaminated soils.	NA	NA	3
	COE-94-PPE02	June 8, 1994	Used PPE from excavation of DDT-contaminated soils.	NA	NA	3
	COE-94-MTH01	April 28, 1994	Spent methanol from decontamination activities.	NA	NA	4
	COE-94-MW001	April 27, 1994	Tar-like waste material, soils, and debris.	94H06L(W)-WC1-01-001	BOBSZ7	1
	NA	May2, 1994	600 cubic yards of DDT-contaminated soil and debris.	94H06L(E)-A01-01-010 94H06L(E)-A01-02-005 94H06L(E)-A01-03-005	BOBSY6 BOBTO0 BOBTO1	3

NORTH SLOPE WASTE INVENTORY (continued)

Site	Drum Number	Accumulation Start Date	Contents	Associated Sample	HEIS No.	Waste Disposition
H-83-L3	COE-94-WW002	June 15, 1994	Wastewater from decontamination activities.	NA	NA	7
	COE-94-MTH02	June 15, 1994	Spent methanol from decontamination activities.	NA	NA	4
	COE-94-WM006	June 17, 1994	Paint waste (dried paint, in 1-gal can).	NA	NA	5
	COE-94-WM007	June 15, 1994	64 1-quart cans of lubricating oil, most full.	NA	NA	6
PSN 04	NA	August 9, 1994	1 55-gallon drum about one quarter full of black, viscous tar-like material (PID=75.0 ppm inside drum).	94PSN04-DS-001-02	BOC3F7	9
PSN 90	NA	July 12, 1994	242 cubic yards of petroleum hydrocarbon contaminated soil and debris.	94PSN90-VR-02-001	BOC3B9	10
PSN 90	NA	July 12, 1994	Approximately 8 gallons of decontamination wastewater.	NA	NA	7

NA Not Applicable

<u>Key to Waste Disposition Codes</u>

1 Shipped to WHC 616 Facility.
2 Contents returned to DDT soil stockpile as dust control.
3 Contents shipped to Chemical Waste Management Facility, Arlington, Oregon, with DDT-contaminated soil and debris.
4 Contents disposed through evaporation.
5 Bulked with other paint waste and shipped to Hanford 100 N Pad for characterization.
6 Lubricating oil bulked for use by Contractor offsite.
7 Decontamination wastewater returned to contaminated soil stockpile at PSN 90 as dust control.
8 Shipped to New Waste Disposal Facility, Pasco, Washington.
9 Shipped to Hanford Central Landfill Facility.
10 Shipped to Chemical Waste Management Facility, Arlington, Oregon.

SECTION 2

V-0201-01

Interim Report
Expedited Response Action
Phase I
Field Activities
Hanford-North Slope

January 1994

Cascade Earth Sciences, Ltd.
7515 N.E. Ambassador Place, Suite L
Portland, Oregon 97220

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
1354 Grandridge Boulevard
Kennewick, Washington 99336-1037
509-735-1280

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

January 20, 1994

Cascade Earth Sciences, Ltd.
7515 N.E. Ambassador Place, Suite L
Portland, Oregon 97220

Attn: Mr. Stuart W. Childs, Ph.D.

RE: EXPEDITED RESPONSE ACTION PHASE I FIELD ACTIVITIES REPORT HANFORD - NORTH SLOPE

This Field Activity Report presents the work accomplished on the Hanford-North Slope during the period November 3, 1993 to December 22, 1993. It summarizes the debris removal, contaminated soil removal, clean soil removal around well structures, and cistern/bunker backfilling. Observation of the removal work was performed by Shannon & Wilson, Inc. as a subcontractor to Cascade Earth Sciences, Ltd (CES).

PROJECT DESCRIPTION

Introduction

This Field Activity Report describes the field work accomplished at the Hanford-North Slope, Washington during the period November 3, 1993 to December 22, 1993. The goal of this expedited response action was to conduct remedial actions in areas accessible to the public. This work was accomplished to eliminate the occurrence of injuries from physical hazards or exposure to potentially hazardous waste. The work consisted of debris removal and elimination of physical hazards, soil sampling to confirm contamination of soil at six separate sites, and backfilling cisterns and bunkers. The work was conducted by CES and Shannon & Wilson for the U.S. Army Corps of Engineers, Walla Walla District (Corps), under Contract No. DACW68-93-D-0002, Delivery Order No. 3 and E.P. Johnson, Inc. under Purchase Orders 94-M-3084 and 93-M-3096.

Site Background

The Hanford-North Slope consists of approximately 140 square miles of land north of the Columbia River across from the active area of the Hanford Site. The North Slope was homesteaded from the late 1800s until the government took control of this area in the early 1940s. Prior to government control of the North Slope, homesteaders used the land primarily for the grazing of sheep and cattle and the growing of row crops and orchards. Wheat was grown on high ground away from the river. Grazing took place on land too arid for crops or too distant from water.

Additional land acquisitions on the North Slope took place in the 1950s for construction of Nike Missile Air Defense System positions (PSN) and antiaircraft gun emplacements as well as to increase the buffer zone between the public land and the production areas of the Hanford Site. A total of seven antiaircraft gun emplacements and three Nike Missile positions were located on the North Slope. The military sites were closed in the early 1960s. Many of the buildings were considered a potential hazard to the public and were torn down or decommissioned in the mid-1970s. Evidence remains of the existence of many of these buildings.

With the recent change in mission at the Hanford Site from plutonium production to environmental cleanup, attention has been given to releasing "clean" tracts of land for other uses. Since 1975 the North Slope has been managed by the Washington Department of Wildlife and the U.S. Fish and Wildlife Service. Some areas have been open to the public. Certain areas included in the wildlife management area have been opened to ranchers, who obtained grazing permits, for cattle grazing. The eastern portion of the North Slope contains a wasteway used by local farmers to drain runoff.

An investigation of the North Slope was conducted by Westinghouse Hanford Company (WHC) in 1990. Their report, *North Slope Investigation Report* (WHC 1990), identified thirty-nine sites associated with military or homesteader activities on the Hanford-North Slope.

Scope of Work

The initial scope of work for this project required soil, concrete debris, building material, and trash removal at designated sites within the Hanford-North Slope. Backfilling cisterns, bunkers, and a septic tank was also required. This scope was modified to include excavation around eight existing well structures. The second scope of work for this project consisted of sampling petroleum-contaminated soil and disposing of it in a commercial landfill. The third scope of work required concrete slurry backfilling of designated underground bunkers and water cisterns. The work areas are shown on Figure 1 and contract tasks are shown in Table 1.

PROJECT ORGANIZATION AND RESPONSIBILITIES

These field activities were conducted by CES, Shannon & Wilson, and E.P. Johnson for the Corps as shown in the enclosed organization charts (Figures 2 and 3). Work was performed in accordance with the approved Field Activities Plan and Site Health and Safety Plan developed for this project. The CES and Shannon and Wilson field manager/site geologist observed the field activities which included debris/soil removal, soil sampling, evidence of subsurface debris, and cistern filling. This individual was also responsible for alerting the Shannon & Wilson Project Manager of any changed conditions and acted as the Site Health and Safety Manager for CES and Shannon & Wilson personnel.

SITE ACTIVITIES

Overview

The primary tasks undertaken by the contractor, E.P. Johnson and recorded by the field manager/site geologist were:

- Debris removal
- Contaminated soil removal
- Clean soil removal around well structures
- Cistern/bunker backfilling
- Concrete sawing

The field manager/site geologist's field notes are located in Appendix B.

Site Access

Extreme care was taken by the contractor to protect the fragile arid environment. Existing roads were used at all times, unless directed by the Corps. Vehicle widths did not exceed the width of the road and wheelbarrows were often used for the debris removal to minimize damage to the sagebrush/grasslands.

Documentation

Site activities were documented by the CES and Shannon and Wilson field manager/site geologist. The observations were recorded in a "Rite in the Rain" all-weather notebook and then transcribed in the format shown in the work plan and included in Appendix B of this report.

Debris Removal

On Friday, November 5, 1993, personnel from E.P. Johnson monitored by E.J. Aragon of Shannon & Wilson began debris removal. Appendix A is a listing of sites and their status as of contract completion on December 22, 1993

Contaminated Soil Removal

On Monday, November 8, 1993, personnel from CES, Shannon & Wilson, and E.P. Johnson sampled suspected petroleum contaminated soil at the WDOT Gravel Pit, No. 47. Initial surface tests with the Hanby™ Screening System revealed contamination levels of 7700 mg/kg at Stained Soil Site 1. The soil was then excavated with a Kubota Trackhoe and stockpiled on visqueen. A very contaminated layer, located at a depth of four feet below the surface, was encountered and samples were taken for laboratory analysis. This contaminated zone was much larger than had been anticipated by Corps personnel.

At Stained Soil Site 2 in the same Gravel Pit, the surface contaminated soil was removed and stockpiled on visqueen and a sample collected from the scraped area was tested with the Hanby™. The test indicated a hydrocarbon concentration of 200 mg/kg which is below the cleanup threshold. Rich Fink of the Corps directed the trackhoe operator to remove additional soil to verify that the contaminated zone had been identified and removed. At a depth of one foot below this "clean" layer the same contaminated layer identified at Stained Soil Site 1 was again encountered. Samples collected from the scraped area and the stockpile of Stained Soil Site 2 were sent to the U.S. Army Corps of Engineers, North Pacific Division Laboratory at Troutdale, Oregon, for testing.

On November 8, 1993 samples were also collected from the PSN 90 and H-81-R sites. The samples were tested for total petroleum hydrocarbons (TPH) using method WTPH- 418.1 and the results are shown in Table 2. The contaminated soil at the H-81-R Site was removed on November 17, 1993. However, follow-up testing to confirm removal of all contaminants has not been completed. Samples from Clay Pit Cistern, Cow Cistern, and H-81-R were tested using analysis EPA Method 8080 for PCB/Pesticides. The test results are shown in Table 3.

Clean Soil Removal Around Well Structures

On November 3, 1993, excavation around the concrete well structures at PSN 01, PSN 04, and PSN 12/14 sites was started. The concrete well structures at H-83-C and H-83-L sites were also excavated using a small Kubota Trackhoe. This work was completed on November 4, 1993.

Cistern/Bunker Backfilling

The Clay Pit, Cow, Wasteway and Wagon Road Cisterns were completely filled by December 21, 1993 with pit-run gravel from Central Pre-Mix Concrete Company in Pasco, Washington. Ten loads of pit-run gravel were hauled to the site by E.P. Johnson, Inc. The underground bunkers at the H-06-L and H-12-L sites were filled with concrete slurry and the septic tanks at the PSN 72/82 and PSN 80 sites were also filled with concrete slurry.

Concrete Sawing

No concrete sawing was accomplished during this period of work.

FOLLOW-UP

Overview

The work described in this Phase I Field Activities Report and completed by CES, Shannon & Wilson, and E.P. Johnson closed out a large portion of the work outlined in the scope of work for this phase. Some work, outlined in the scopes of work, has not been completed.

Table 4 shows a matrix of the completed and remaining tasks. A brief description of the tasks to be completed is outlined below.

Debris Removal

Debris removal needs to be completed at the following sites:

Dune Homestead	Overlook and Homestead Site	Stove Site
Coyote Bait Can	Power Pole 12-3 Site	Lonetree Homestead
Asphalt Batch Plant Site	WDOT Gravel Pit, No. 47 Site	H-06-L Site

Contaminated Soil Removal

Contaminated soil has been removed from H-81R Site and from five barrels at PSN 80. Contaminated soil remains at the WDOT Gravel Pit, No. 47 and PSN 90 Sites. The H-81R site has been tested with the Hanby™ Kit to verify removal of all contaminated soil. An investigation has been initiated into the method of disposal of the contaminated soil from the H-81-R Site and the barrels from PSN 80. The Corps and U.S. Department of Energy (DOE) are conducting separate inquiries into the circumstances that caused the irregularity in disposal of the material. Shannon & Wilson has provided information to the Corps to support both of these investigations. The Shannon & Wilson site geologist, E. J.Aragon, was also interviewed by a representative of the Washington State Department of Ecology on this matter. To the best of our knowledge, Shannon & Wilson performed as directed by the Corps to fulfill the requirements of the work plan.

Cistern/Bunker Backfilling

The hydraulic lift bays at the PSN 90 Site and newly discovered septic tanks discovered at the H-83-C and H-83-L sites need to be completely backfilled with slurry. Cisterns Nos. 4 and 6 at the Hanford-ALE Reserve were also not filled with slurry. The cisterns at the Power Pole 12-3 Site and the Overlook and Homestead Site need to be backfilled with pit-run material.

Summary

The statement of work for the Phase I clean-up on the Hanford-North Slope identified tasks on 26 of the initial 39 sites identified by WHC in their report (WHC 1990). Of these 26 sites, 14 were completely closed out. Twelve of the sites still have work to be completed, including soil removal, concrete sawing, and debris removal. This work was not completed because the contract completion date of December 22, 1993 was reached and all the funds budgeted for the E.P. Johnson purchase orders were expended.

We have appreciated the opportunity to be of service to you on this project. Should you have any comments or questions regarding this report, please contact us.

Sincerely,

SHANNON & WILSON, INC.

EXPIRES 12/11/95

George R. Gardner
Senior Environmental Engineer

Jess T. Abed, P.E.
Vice President

GRG:JTA/grg

Enclosures:
- Table 1 Contract Task Matrix (2 pages)
- Table 2 TPH Test Results
- Table 3 PCB/Pesticides Test Results
- Table 4 Task Completion Matrix (2 pages)
- Figure 1 Vicinity Map
- Figure 2 Contract Organization
- Figure 3 Project Organization
- APPENDIX A - SITE STATUS REPORT
- APPENDIX B - FIELD REPORTS
- APPENDIX C - PHOTOS

12-20-93/V0201.RPT/V0201.01/ejh

TABLE 1

CONTRACT TASK MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contaminated Soil	Slurry Backfill Septic Tanks/ Bunkers
Phase 1A					
Hanford Firing Range Point and Target Area	X				
Additive Item No. 1					
Dune Homestead	X				
Stove Site	X				
Power Pole 12-3 Site	X		X		
H-12-L Site					Z
Wagon Road Site	X		X		
Lonetree Homestead	X				
Overlook and Homestead Site	X		X[1]		
Coyote Bait Can	X				
Phase 1B					
H-06-L	X	Y			Z
PSN 07/10 Site	X				
PSN 04 Site	X	Y			
PSN 01 Site		Y			
Additive Item No. 1					
Wasteway Site	X		X		
Clay Pit Cistern	X		X	W	
Cow Cistern	X		X		

TABLE 1 (continued)

CONTRACT TASK MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contaminated Soil	Slurry Backfill Septic Tanks/ Bunkers
Phase 1C					
Igloo Site	X				
Asphalt Batch Plant Site	X				
PSN 90 Site	X[2]			W, X[3]	
WDOT Gravel Pit, No. 47	X			W, X[3]	
H-83-L Site	X	Y			
PSN 80 Site	X				
H-83-C Site	X	Y			
H-81-R Site	X			W, X[3]	
PSN 72/82 Site	X	Y			X[4]
Bridge View Site	X				

NOTE: W--Items from Requisition No. W68SBV-3244-DP01.
X--Items from Requisition No. W68SBV-3228-DP01.
Y--Items from Change to Requisition No. W68SBV-3228-DP01.
Z--Items from Requisition No W68SBV-3265-DP01.

[1] Two cisterns.
[2] Excluding concrete rubble.
[3] Additive Item No. 2.
[4] Additive Item No. 3.

TABLE 2

TPH TEST RESULTS

Location	Sample Number	Results* (mg/kg)
WDOT Gravel Pit, No. 47 Site	93-P47-S1-S2	2,070
WDOT Gravel Pit, No. 47 Site	93-P47-S3-S1	290
WDOT Gravel Pit, No. 47 Site	93-P47-S4-S0	3,730
H-81-R Site	93-H81R-S2-S0	42,300
H-81-R Site	93-H81R-S3-S0	14,000
PSN 90 Site	93-PSN90-S1-S0	4,070
PSN 90 Site	93-PSN90-S2-S0	1,200
PSN 90 Site	93-PSN90-S3-S2	2,330
PSN 90 Site	93-PSN90-S4-S2	750

*Action Level -- 200mg/kg [WAC (MTCA)]

TABLE 3

PCB/PESTICIDES TEST RESULTS

Location	Sample Number	Contaminant	Results (ug/kg)
Clay Pit Cistern Site	93-CPC-S1-S0	None	ND
Cow Cistern Site	93-CC-S2-S0	None	ND
H-8-R Site	93-H81R-S1-S0	4,4'-DDE	41
		Endrin aldehyde	2.2

TABLE 4

TASK COMPLETION MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contami-nated Soil	Slurry Backfill Septic Tanks/ Bunkers
Phase 1A					
Hanford Firing Range Point and Target Area	X				
Additive Item No. 1					
Dune Homestead	X				
Stove Site	X				
Power Pole 12-3 Site	X		X		
H-12-L Site					Z
Wagon Road Site	X		X		
Lonetree Homestead	X				
Overlook and Homestead Site	X		X[1]		
Coyote Bait Can	X				
PSN 12/14 Site		Y			
Phase 1B					
H-06-L	X	Y			Z
PSN 07/10 Site	X				
PSN 04 Site	X	Y			
PSN 01 Site		Y			
Additive Item No. 1					
Wasteway Site	X		X		
Clay Pit Cistern	X		X	W	
Cow Cistern	X		X		

TABLE 4 (Continued)

TASK COMPLETION MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contami-nated Soil	Slurry Backfill Septic Tanks/ Bunkers
Phase 1C					
Igloo Site	X				
Asphalt Batch Plant Site	X				
PSN 90 Site	X[2]			W[3], X[4]	
WDOT Gravel Pit, No. 47	X			W[3], X[4]	
H-83-L Site	X	Y			
PSN 80 Site	X				
H-83-C Site	X	Y			
H-81-R Site	X			W[3], X[4]	
PSN 72/82 Site	X	Y			X[5]
Bridge View Site	X				

NOTE: W--Items from Requisition No. W68SBV-3244-DP01.
X--Items from Requisition No. W68SBV-3228-DP01.
Y--Items from Change to Requisition No. W68SBV-3228-DP01.
Z--Items from Requisition No. W68SBV-3265-DP01.

[1] Two cisterns.
[2] Excluding concrete rubble.
[3] All initial sampling is complete.
[4] Additive Item No. 2.
[5] Additive Item No. 3.

Completed Task

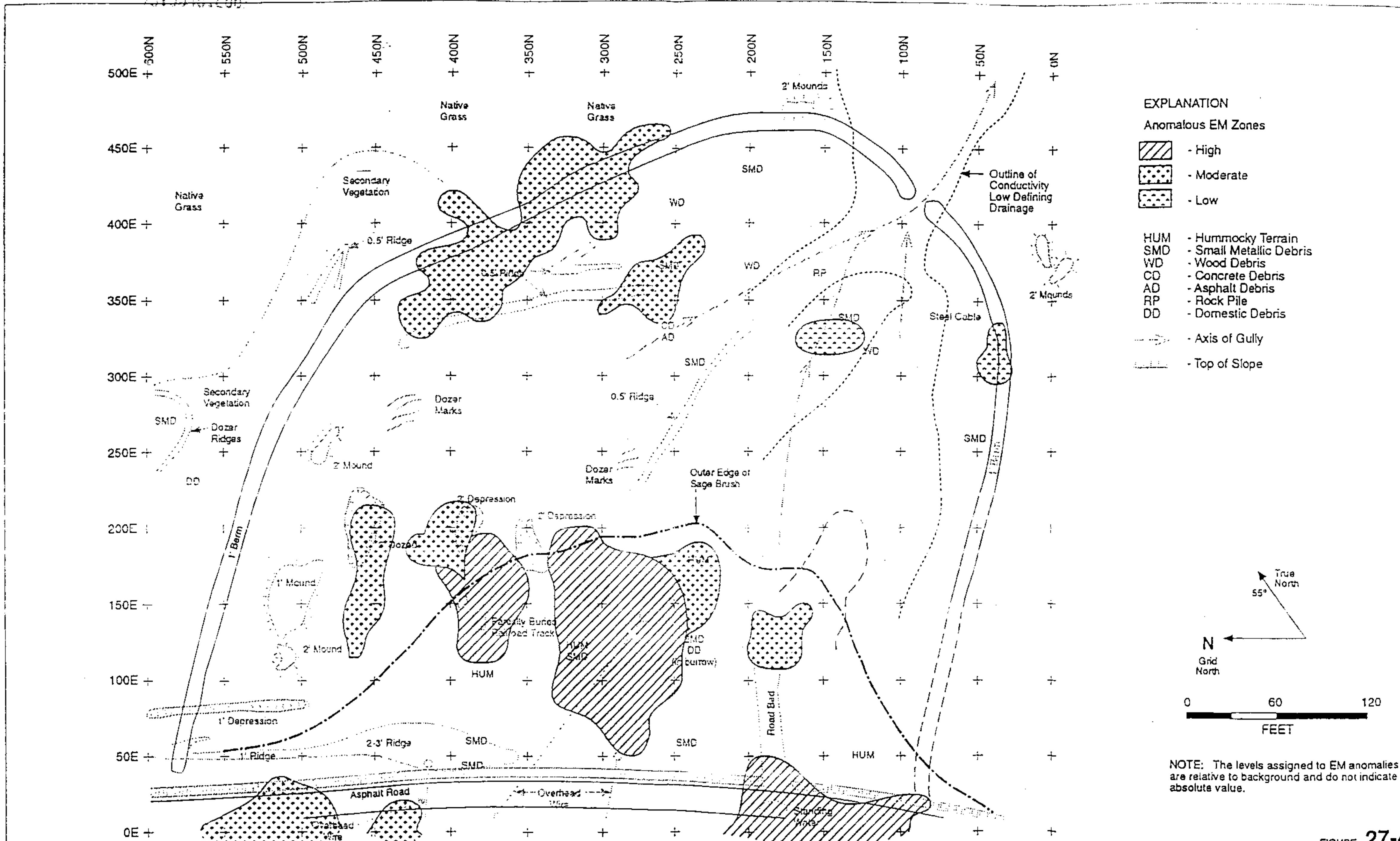


FIGURE 27-4
EM-31 INTERPRETATION MAP
HORSESHOE SITE
MW/1100 AREA RD/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 50104 DATE 8/4/94 DRAWN BY TX

Golder Associates

9513346.2869

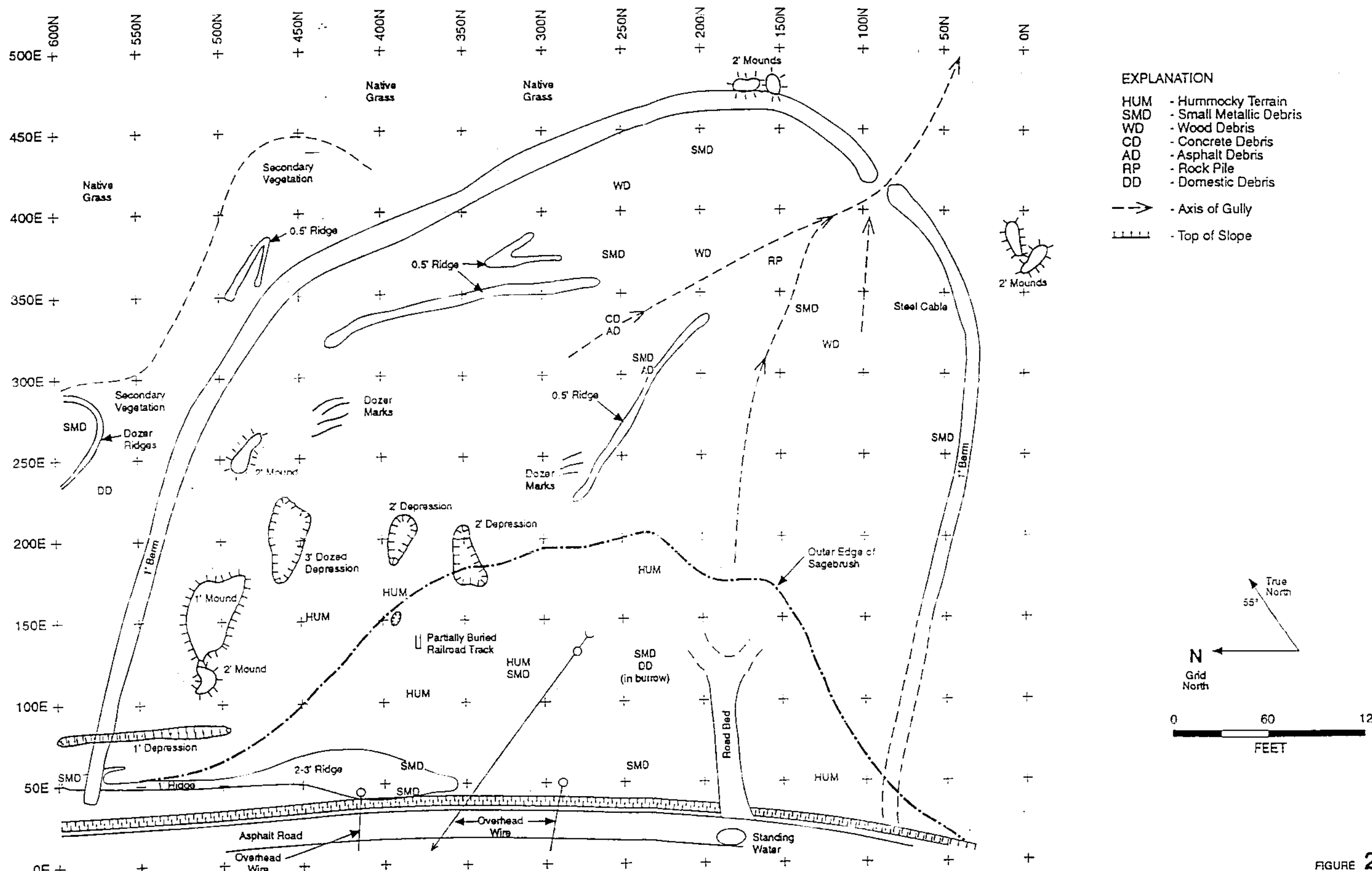


FIGURE 27-1
SURFACE FEATURE MAP
HORSESHOE SITE
MW/1100 AREA RD/RA/WA

9513356.2669

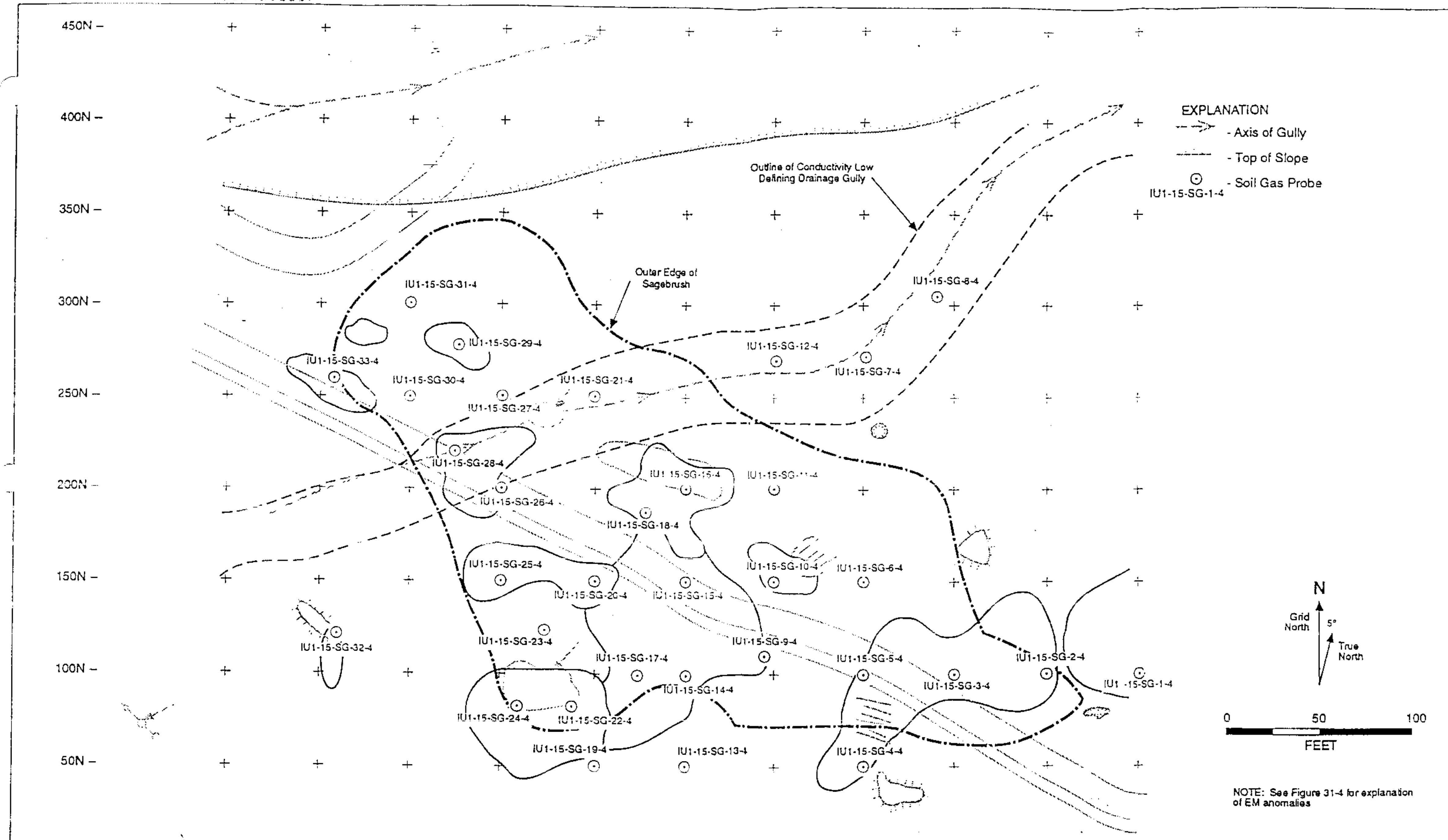


FIGURE 31-8
SOIL GAS PROBE LOCATIONS
H-52-L NIKE BASE LANDFILL
MW/1100 AREA RO/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 50106 DATE 8/1/94 DRAWN BY TK

Golder Associates

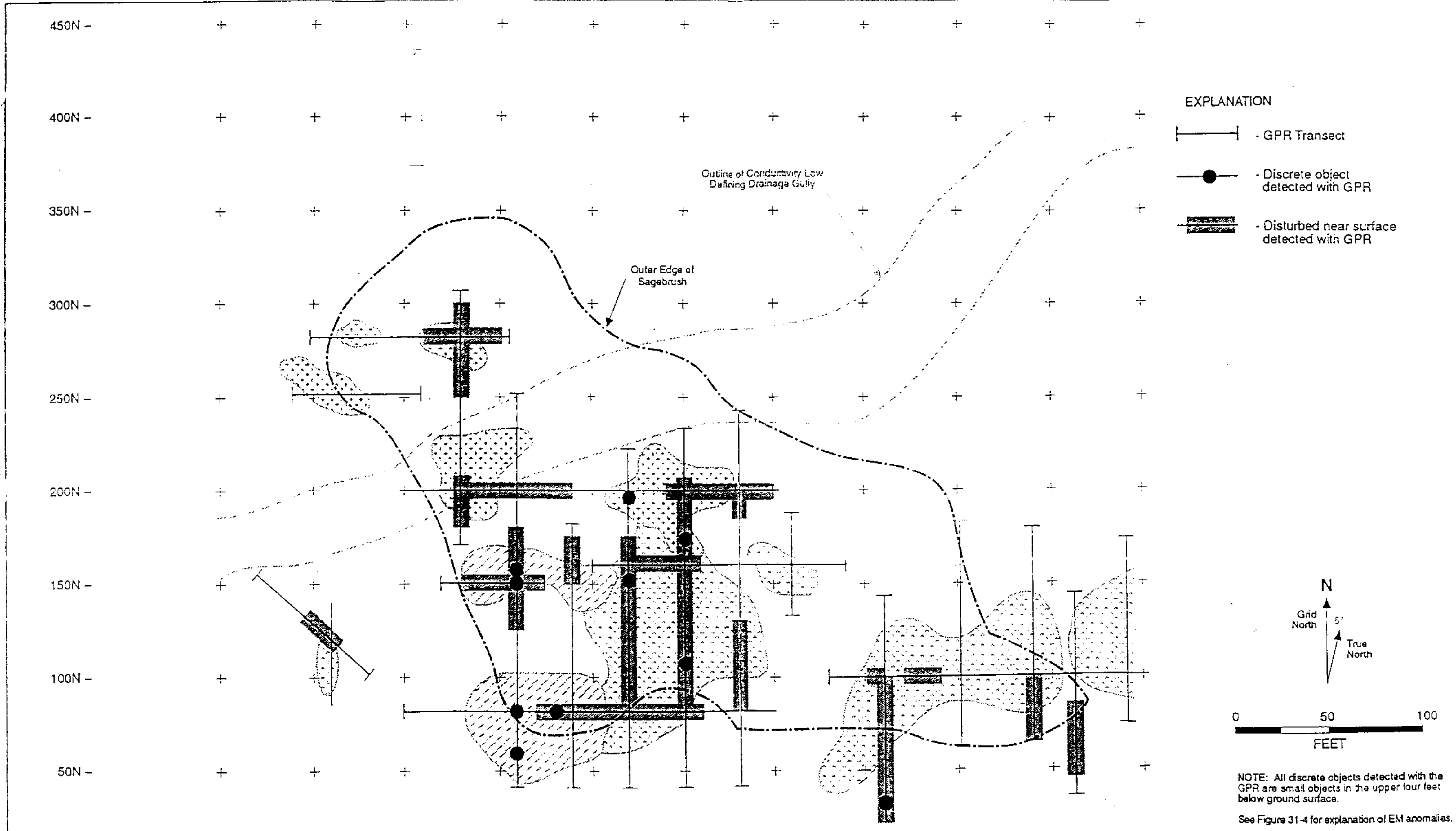


FIGURE 31-7
GPR INTERPRETATION MAP
H-52-L NIKE BASE LANDFILL
MW/1100 AREA RD/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 50102 DATE 8/4/94 DRAWN BY TK

Golder Associates

9513346.2671

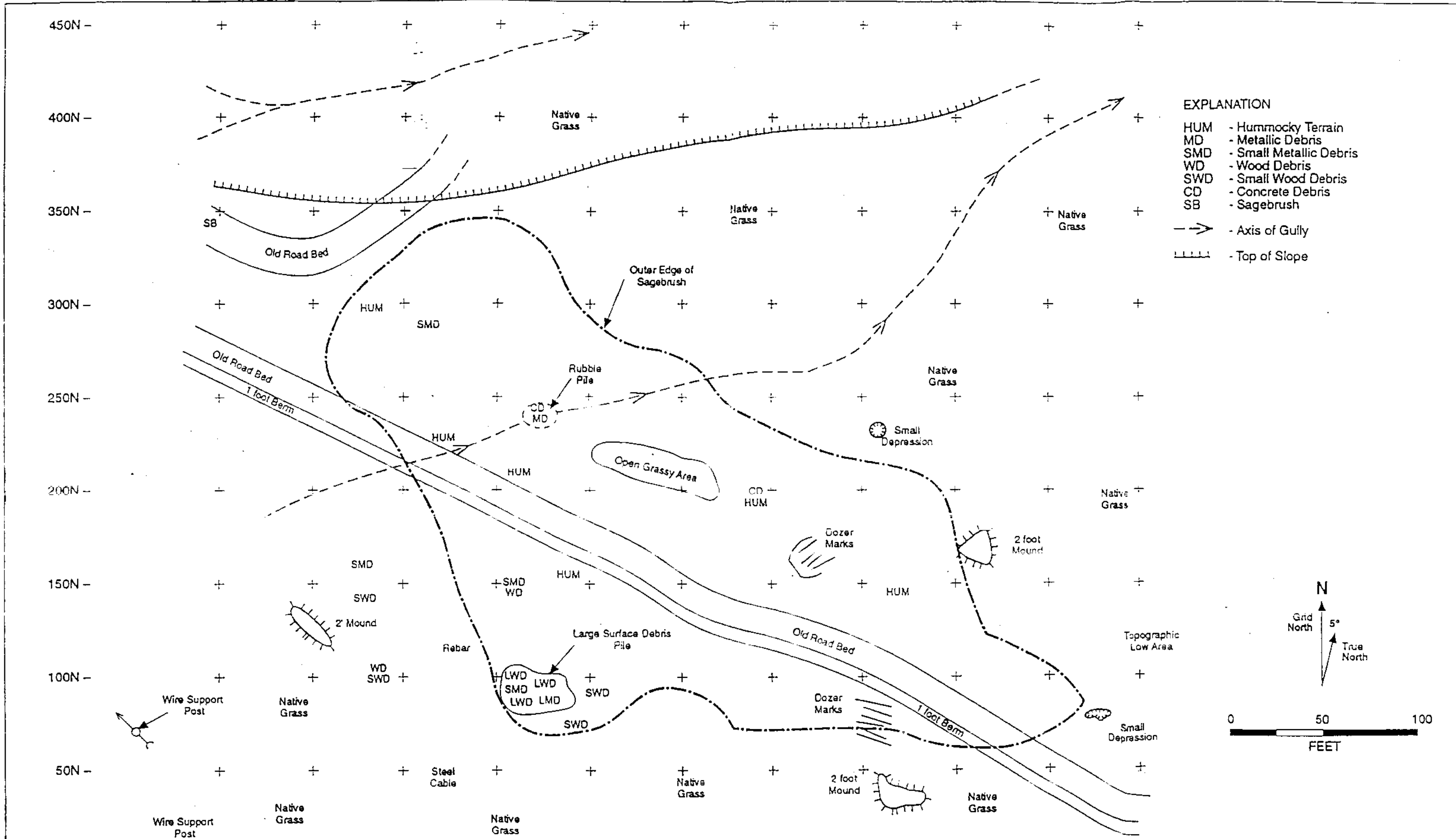


FIGURE 31-1
SURFACE FEATURE MAP
H-52-L NIKE BASE LANDFILL
MW/1100 AREA RD/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 50100 DATE 7/27/94 DRAWN BY TK

Golder Associates

9513346.2672

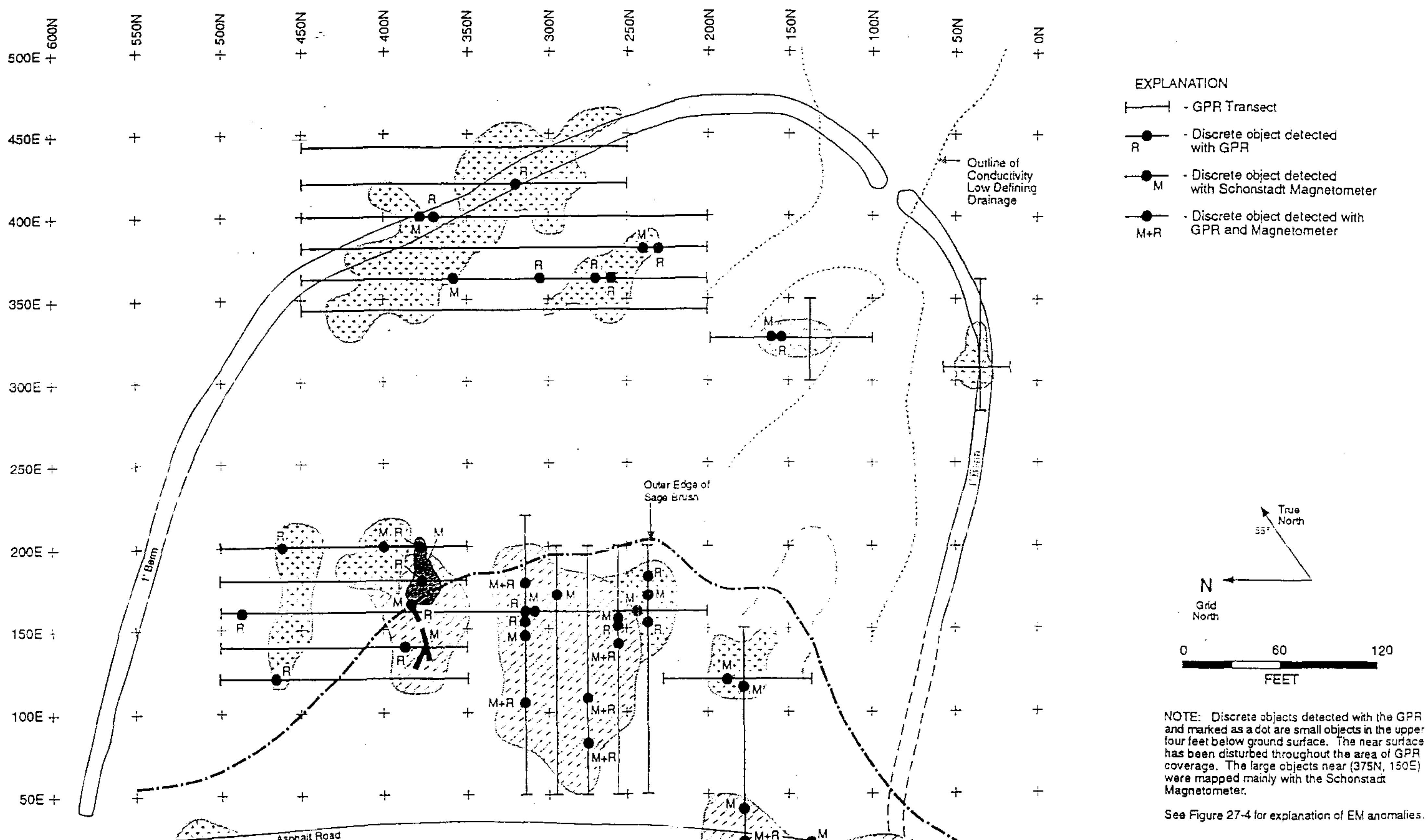


FIGURE 27-6
GPR AND MAGNETOMETER INTERPRETATION MAP
HORSESHOE SITE
MW/1100 AREA RD/RA/WA

9513346.2675

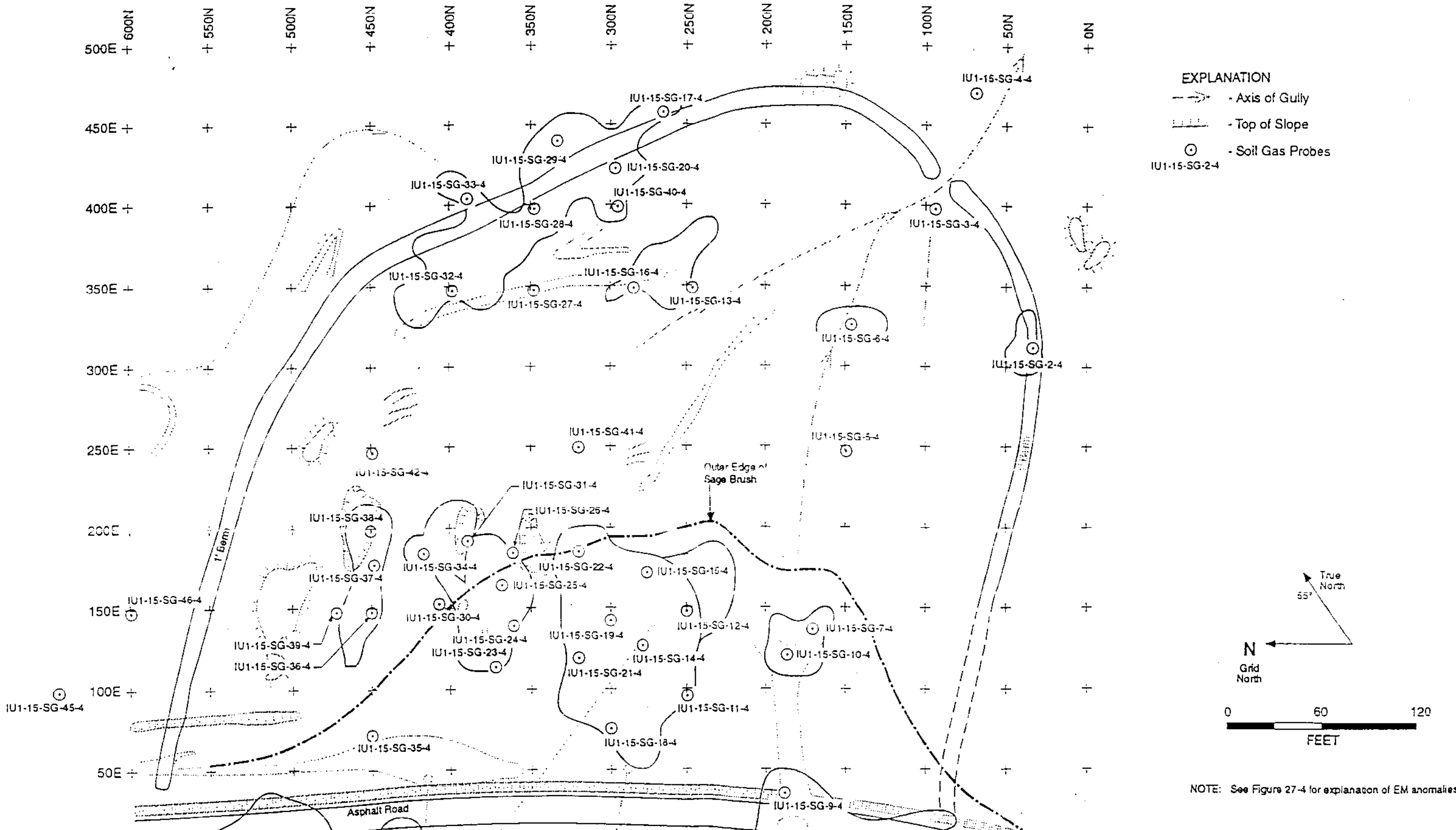


FIGURE 27-7
SOIL GAS PROBE LOCATIONS
HORSESHOE SITE
MW/1100 AREA RD/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 50110 DATE 8/2/94 DRAWN BY TX

Golder Associates

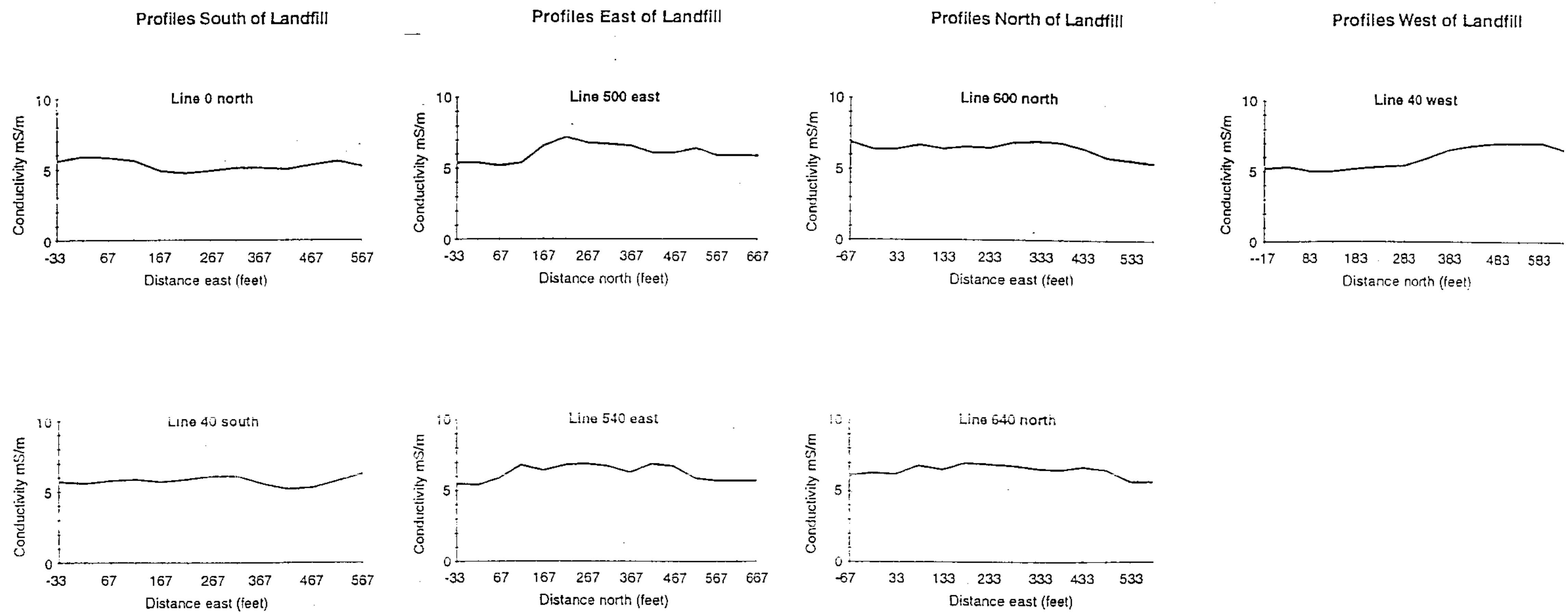
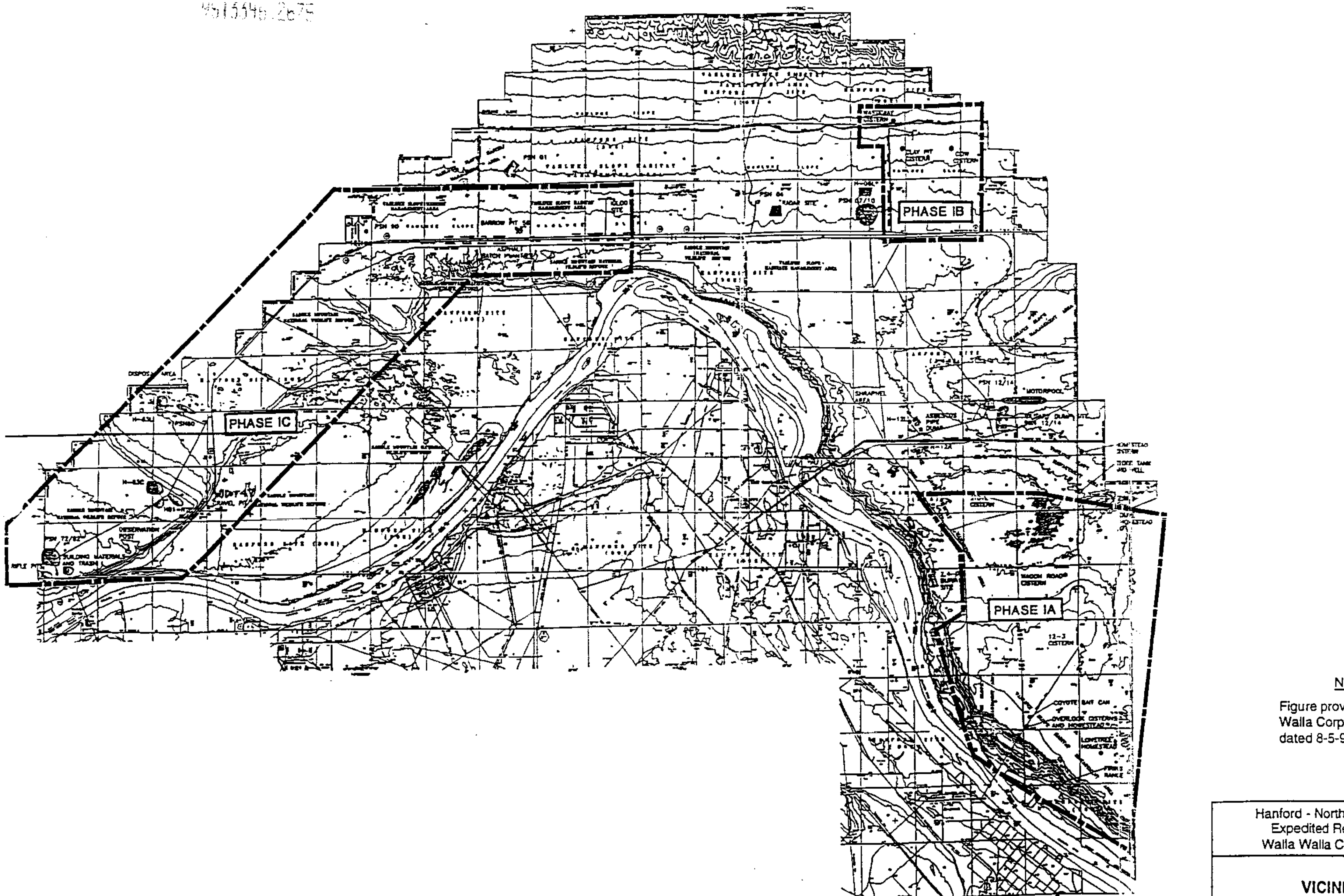


FIGURE 27-5
EM-34 PROFILES AROUND PERIMETER OF LANDFILL
HORIZONTAL DIPOLE
HORSESHOE SITE
MW/1100 AREA RD/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 53199 DATE 7/28/94 DRAWN BY EA

Golder Associates

9513546.2675



NOTE

Figure provided by Walla Walla Corps of Engineers, dated 8-5-93.

Hanford - North Slope / D.O. No. 3
Expedited Response Actions
Walla Walla Corps of Engineers

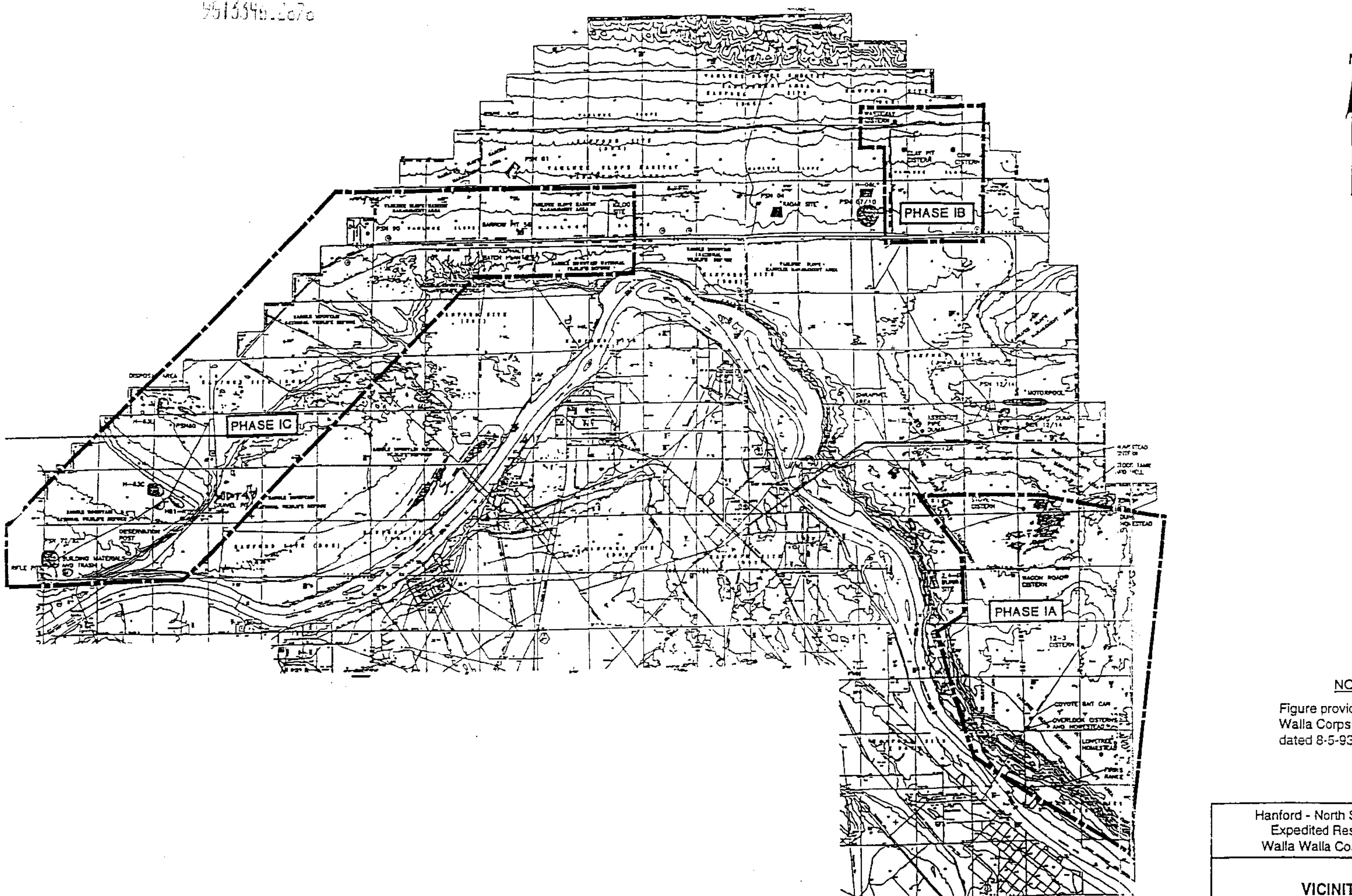
VICINITY MAP

October 1993 V-0201-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1

9513348.2278



NOTE

Figure provided by Walla Walla Corps of Engineers, dated 8-5-93.

Hanford - North Slope / D.O. No. 3
Expedited Response Actions
Walla Walla Corps of Engineers

VICINITY MAP

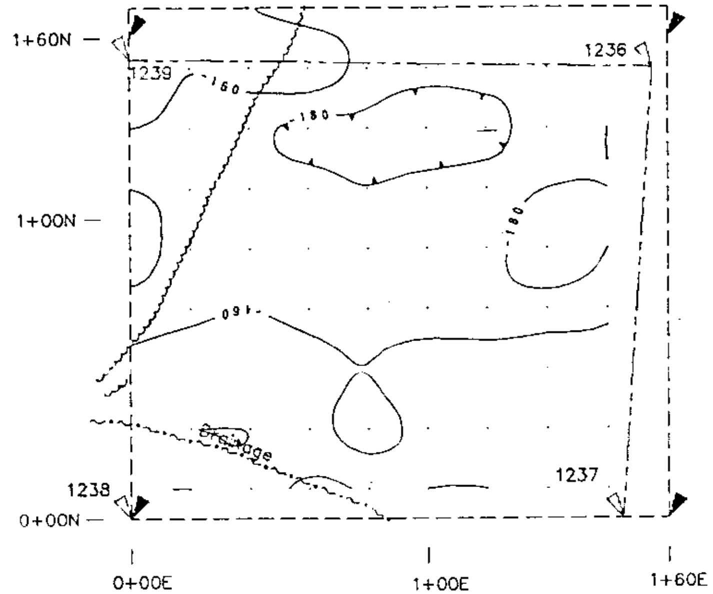
October 1993 V-0201-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

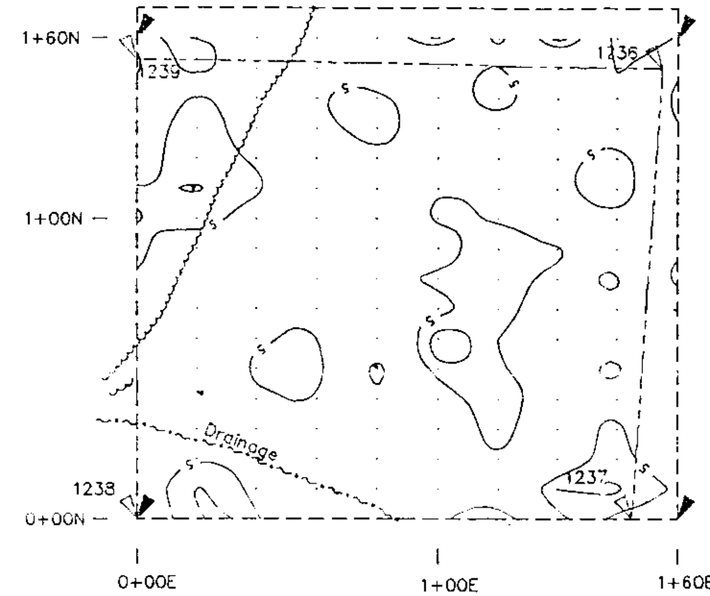
FIG. 1

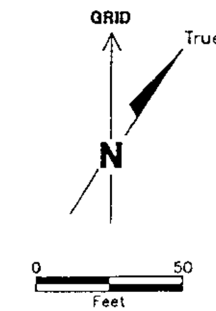
9515346.2645

EM In-Phase Contour Map
Contour interval = 20 millivolts

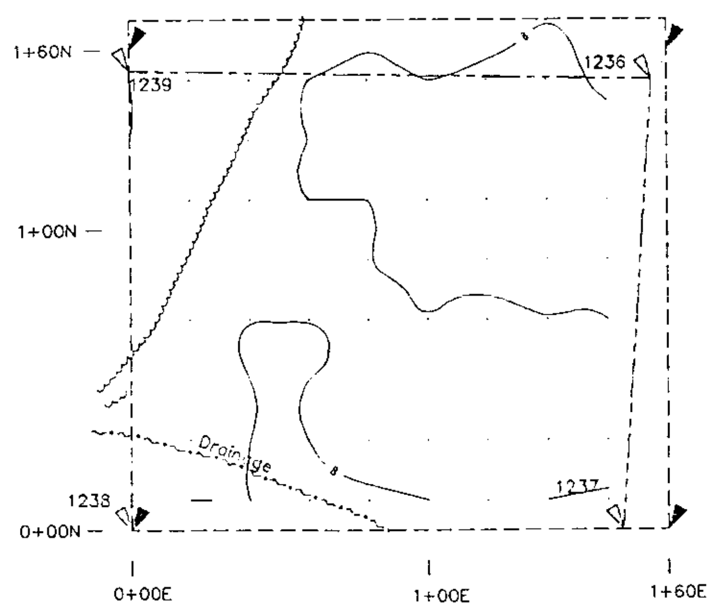


Magnetic Gradient Contour Map
Contour Interval = 5 gammas per foot
(Zero gradient contour removed for clarity)





Terrain Conductivity Contour Map
Contour Interval = 1 millimho per meter



EXPLANATION

GEOPHYSICAL DATA POINT USED FOR CONTOURING

US ARMY COE SITE BOUNDARY AND MARKING LATH

HLA SURVEY AREA BOUNDARY AND MARKING LATH

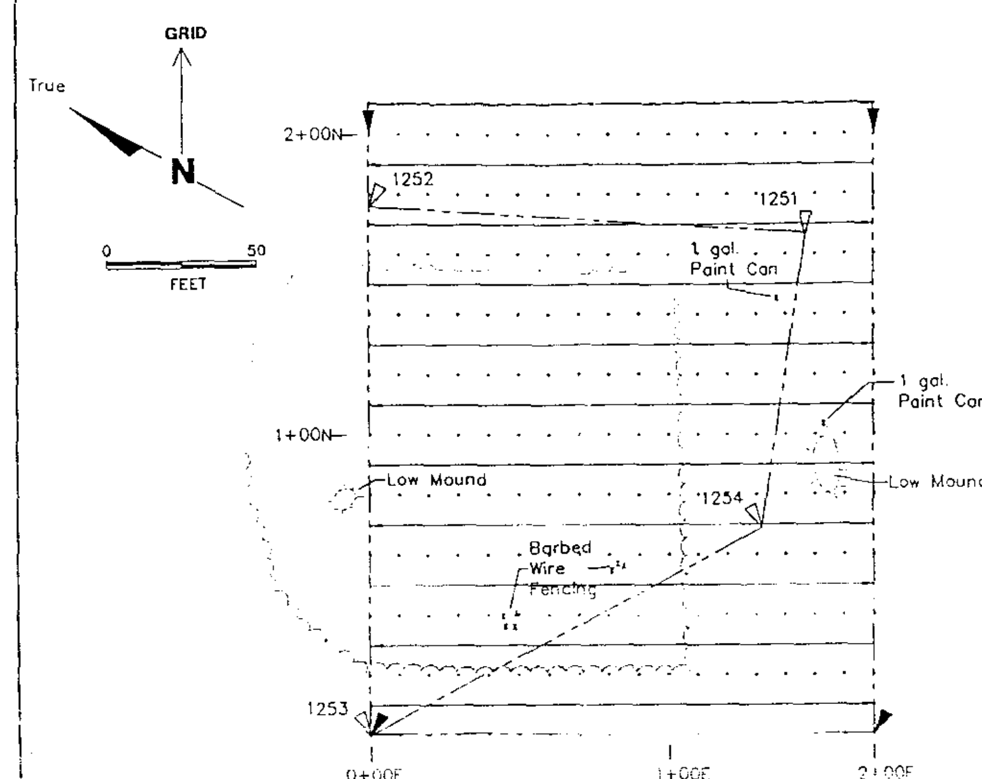
VEGETATION

NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED WITHIN SURVEY GRID
(Anomaly indicative of buried metal was delineated approximately 175 feet north of survey grid, see Plate 2)

DRAFT

Harding Lawson Associates Engineering and Environmental Services	Contour Maps of Geophysical Datasets Site H-81-R CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington		PLATE 3
DRAWN PCB	JOB NUMBER 27969.6	APPROVED	DATE 8/94	REVISED DATE

H81RCONT.DWG



EXPLANATION

EM31-D SURVEY TRANSECT

MAGNETIC GRADIENT MEASUREMENT STATION

1253 — COE Mark Designation Number

US ARMY COE SITE BOUNDARY AND COE INSTALLED MARKING LATH

HLA SURVEY AREA BOUNDARY AND HLA INSTALLED MARKING LATH

VEGETATION

DRAFT

7282CR.DWG

Harding Lawson Associates
Engineering and Environmental Services

HLA

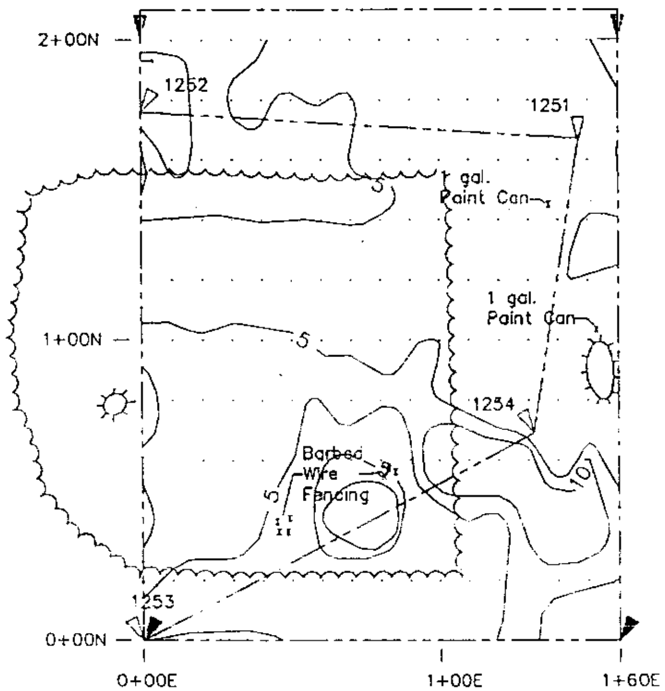
Geophysical Survey Coverage and Results
Site PSN 72/82
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE
4

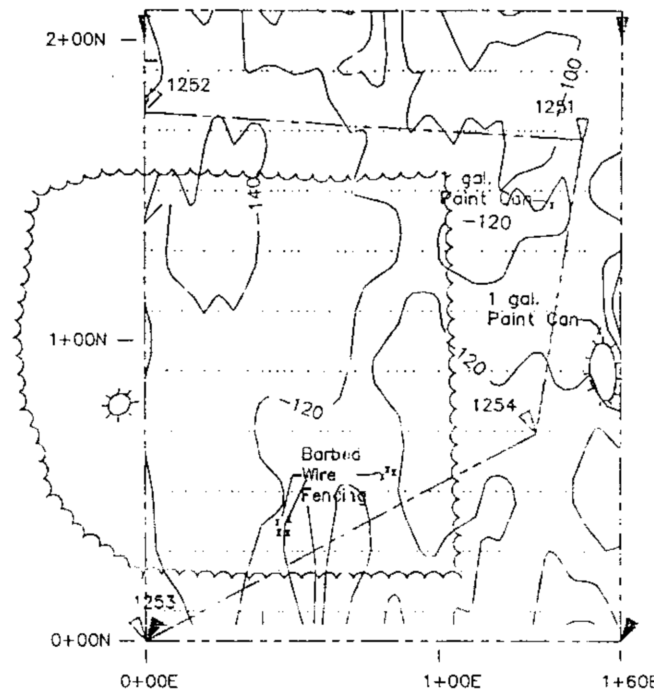
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

9510416.2695

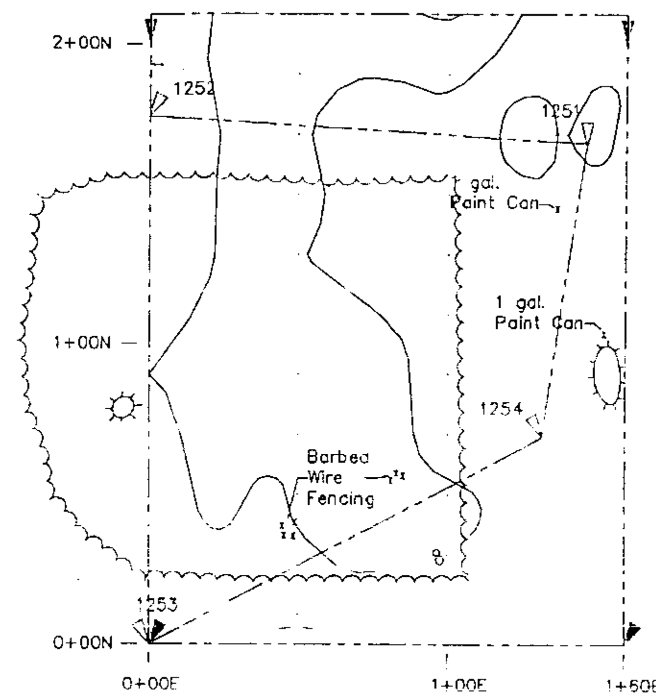
Magnetic Gradient Contour Map
Contour Interval = 5 gammas per foot
(Zero gradient contour omitted for clarity)



EM In-Phase Contour Map
Contour Interval = 20 millivolts
(230 millivolt contour added)



Terrain Conductivity Contour Map
Contour Interval = 2 millimhos per meter



EXPLANATION

· DATA POINT USED FOR CONTOURING

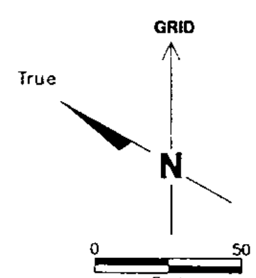
104 — US ARMY COE SITE BOUNDARY AND MARKING LATH WITH NUMBER

HLA SURVEY AREA BOUNDARY AND MARKING LATH

VEGETATION

LOW MOUND

NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE

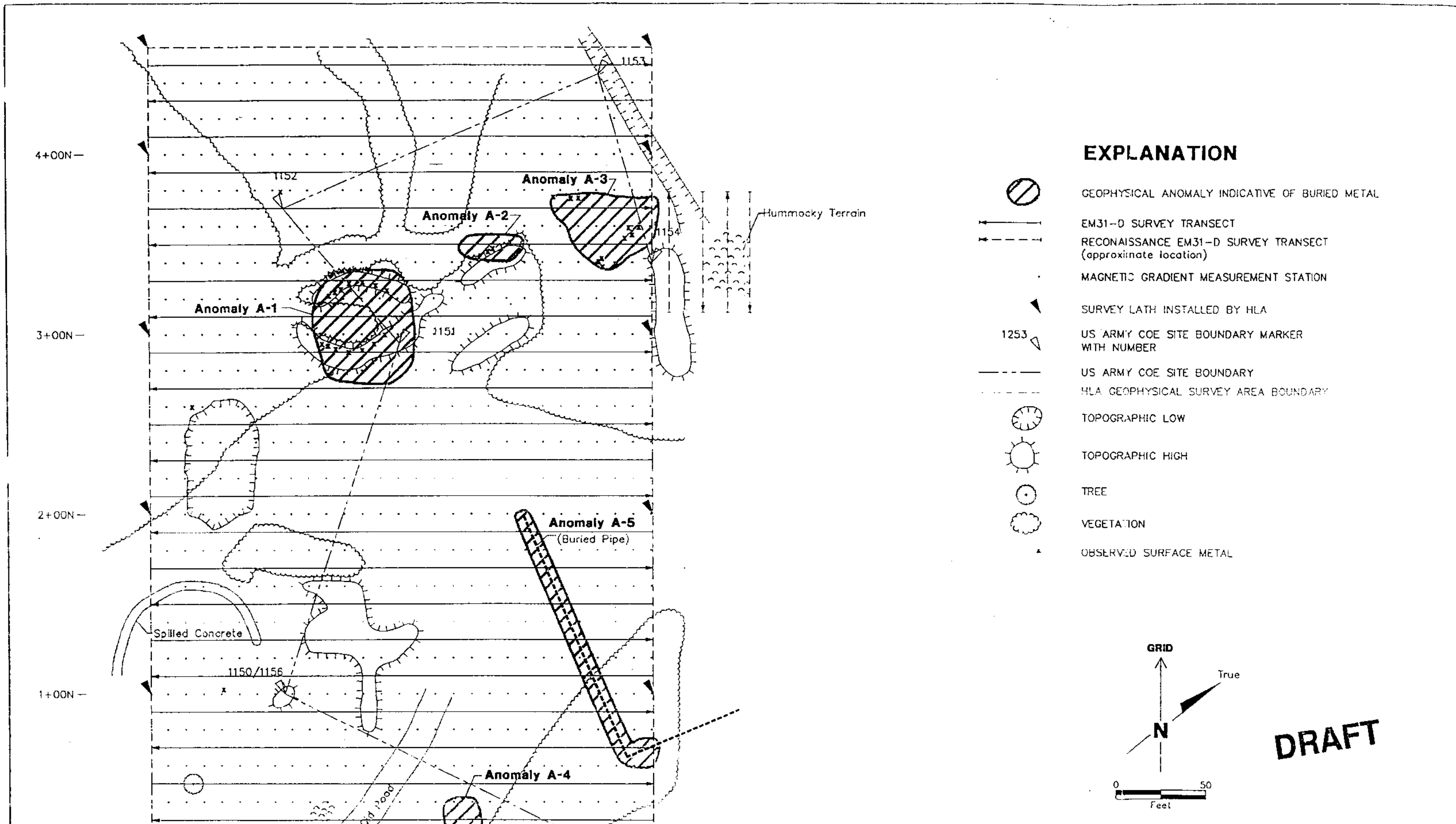


DRAFT

Harding Lawson Associates Engineering and Environmental Services		Contour Maps of Geophysical Datasets Site PSN 72/82 CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington	PLATE **5**
DRAWN PCB	JOB NUMBER 27969,6	APPROVED	DATE 8/94	REVISED DATE

7282CONT.DWG

9513546.2646



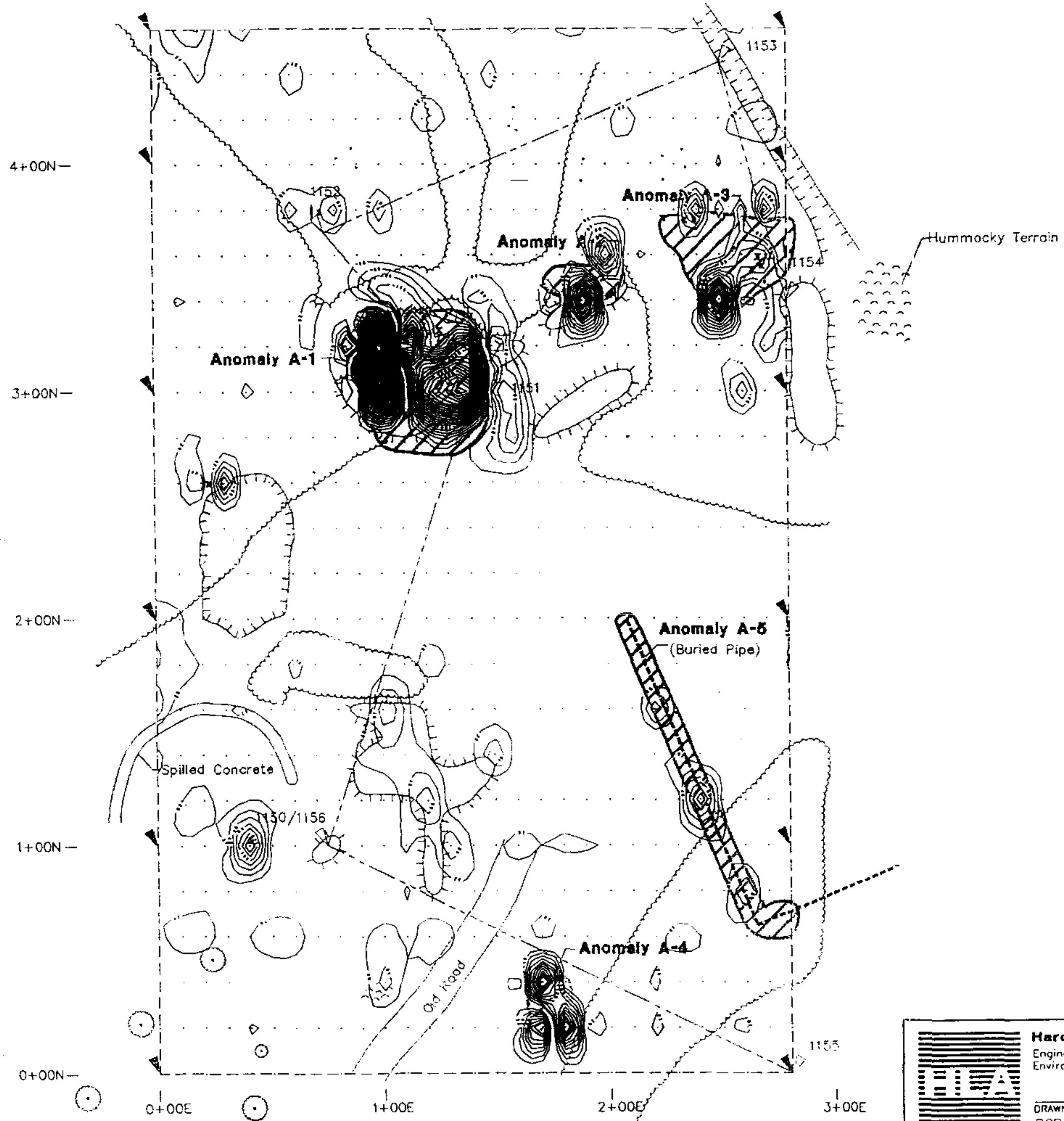
Harding Lawson Associates
Engineering and Environmental Services

Geophysical Survey Coverage and Results
Site PSN 90
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

9513346.2247



EXPLANATION

MAGNETIC GRADIENT CONTOUR
CONTOUR INTERVAL = 20 GAMMAS PER FOOT
(Zero gradient contour omitted for clarity)

MAGNETIC GRADIENT DATA POINT USED FOR CONTOURING

GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL

SURVEY LATH INSTALLED BY HLA

1253 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER

US ARMY COE SITE BOUNDARY

HLA GEOPHYSICAL SURVEY AREA BOUNDARY

TOPOGRAPHIC LOW

TOPOGRAPHIC HIGH

TREE

VEGETATION

OBSERVED SURFACE METAL

GRID
True
N
0 50
Feet

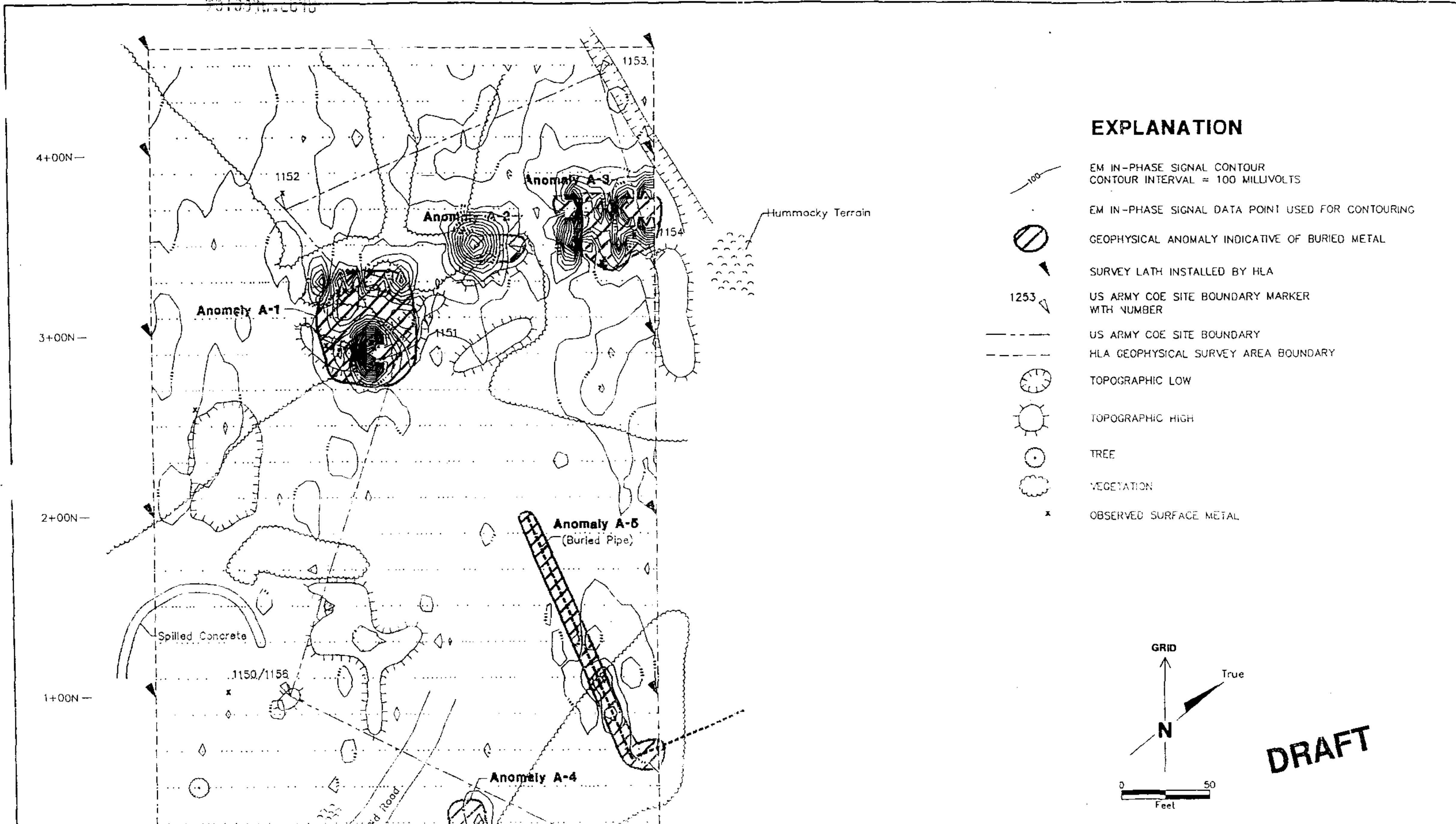
DRAFT

Harding Lawson Associates
Engineering and Environmental Services

Magnetic Gradient Contour Map
Site PSN 90
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969,6		8/94	



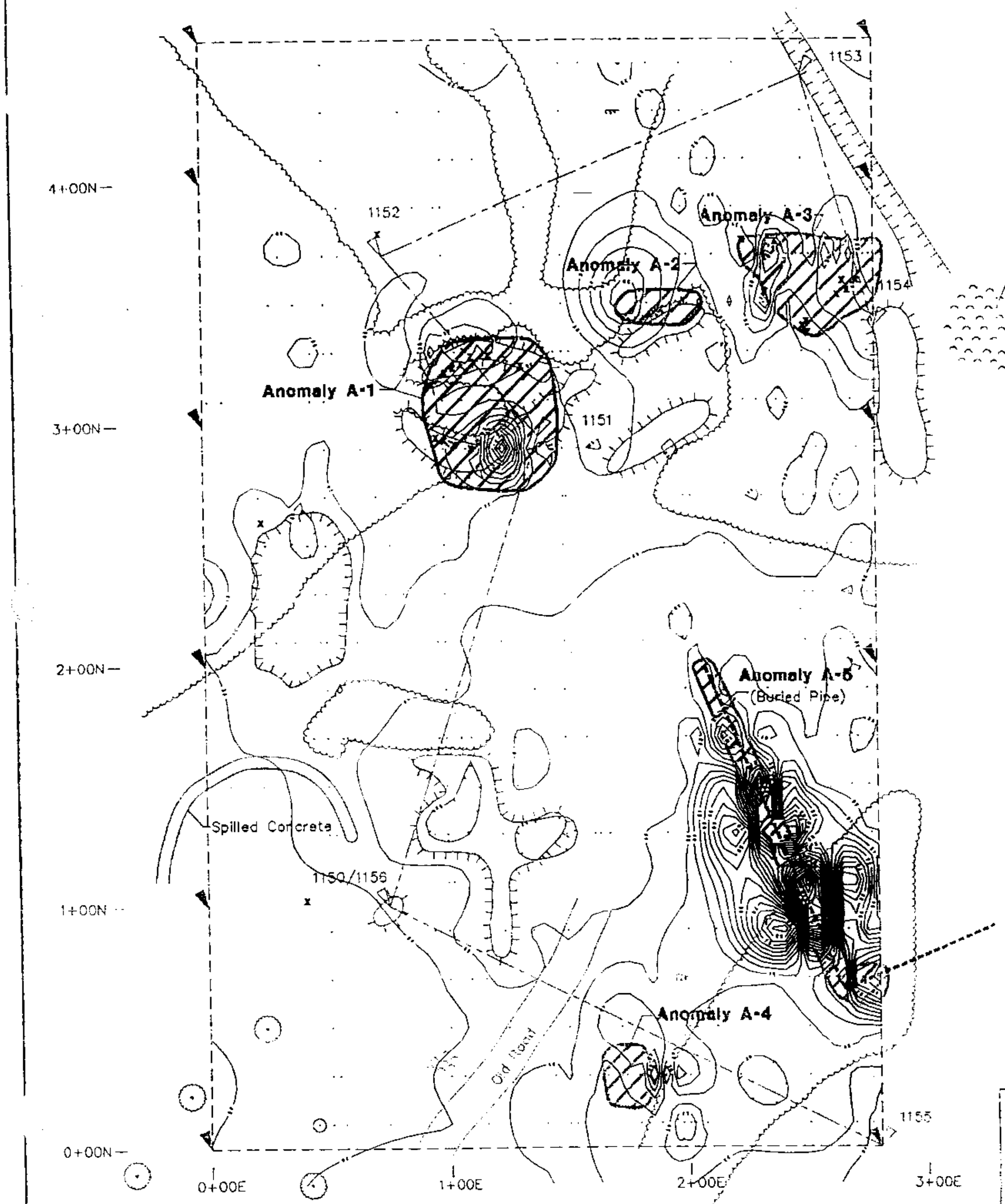
Harding Lawson Associates
Engineering and Environmental Services

EM In-Phase Signal Contour Map
Site PSN 90
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969,6		8/94	

9513346.2849



EXPLANATION

- TERRAIN CONDUCTIVITY CONTOUR (Contour Interval = 5 millimhos per meter)
- TERRAIN CONDUCTIVITY DATA POINT USED FOR CONTOURING
- GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL
- SURVEY LATH INSTALLED BY HLA
- 1253 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER
- US ARMY COE SITE BOUNDARY
- HLA GEOPHYSICAL SURVEY AREA BOUNDARY
- TOPOGRAPHIC LOW
- TOPOGRAPHIC HIGH
- TREE
- VEGETATION
- OBSERVED SURFACE METAL

GRID
True
N

0 50
Feet

DRAFT

Harding Lawson Associates
Engineering and Environmental Services

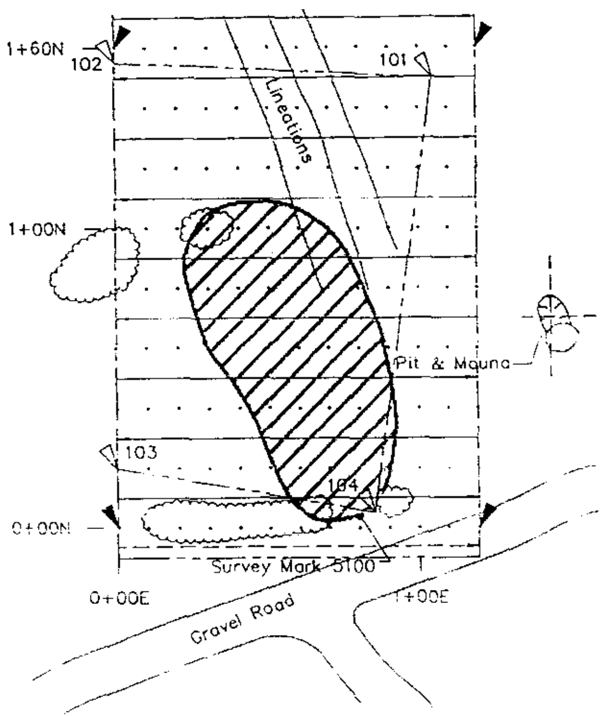
Terrain Conductivity Contour Map
Site PSN 90
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969,6		8/94	

9513346.2650

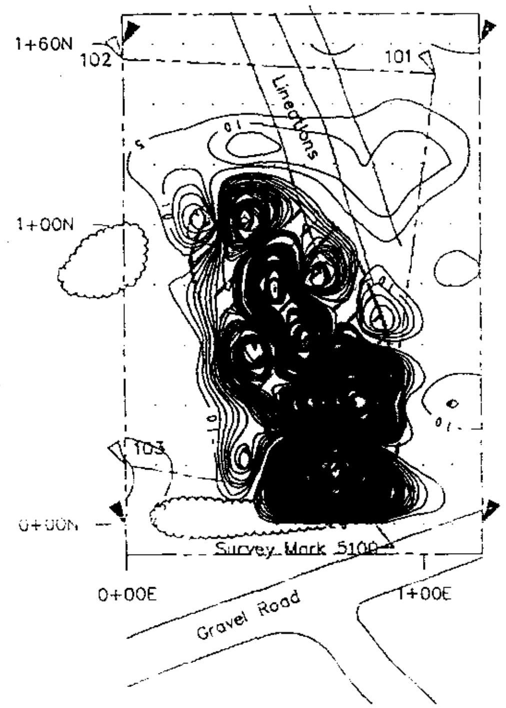
Geophysical Survey Coverage and Anomaly Map



Magnetic Gradient Contour Map

Contour Interval = 5 gammas per foot

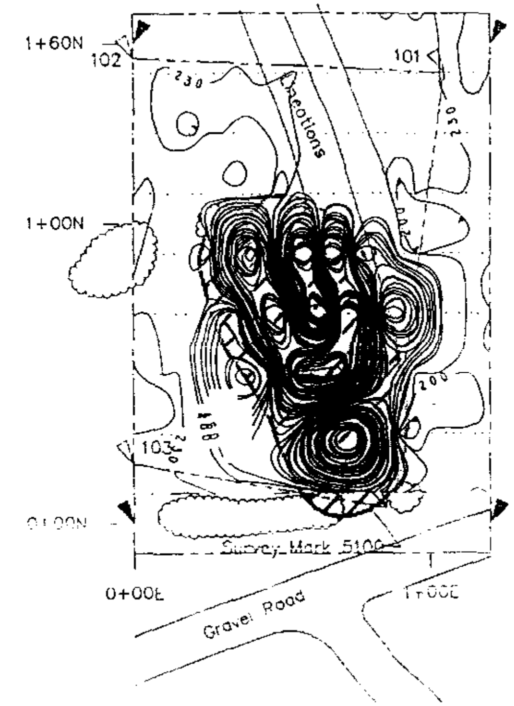
(Zero gradient contour omitted for clarity)



EM In-Phase Contour Map

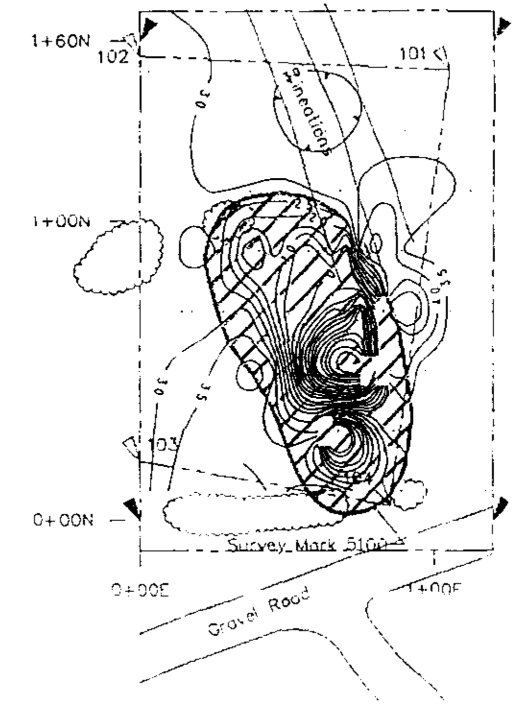
Contour Interval = 100 millivolts

(230 millivolt contour added)



Terrain Conductivity Contour Map

Contour Interval = 5 millimhos per meter



EXPLANATION

GEOPHYSICAL ANOMALY INDICATIVE OF LANDFILL

EM31-D SURVEY TRANSECT

RECONNAISSANCE EM31-D SURVEY TRANSECT (approximate location)

MAGNETIC GRADIENT MEASUREMENT STATION

DATA POINT USED FOR CONTOURING

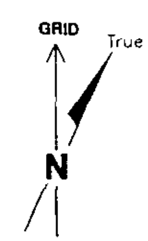
US ARMY COE SITE BOUNDARY

HLA SURVEY AREA BOUNDARY

SURVEY LATH INSTALLED BY HLA

104 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER

VEGETATION



0 50
Feet

DRAFT

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Engineering and Environmental Services

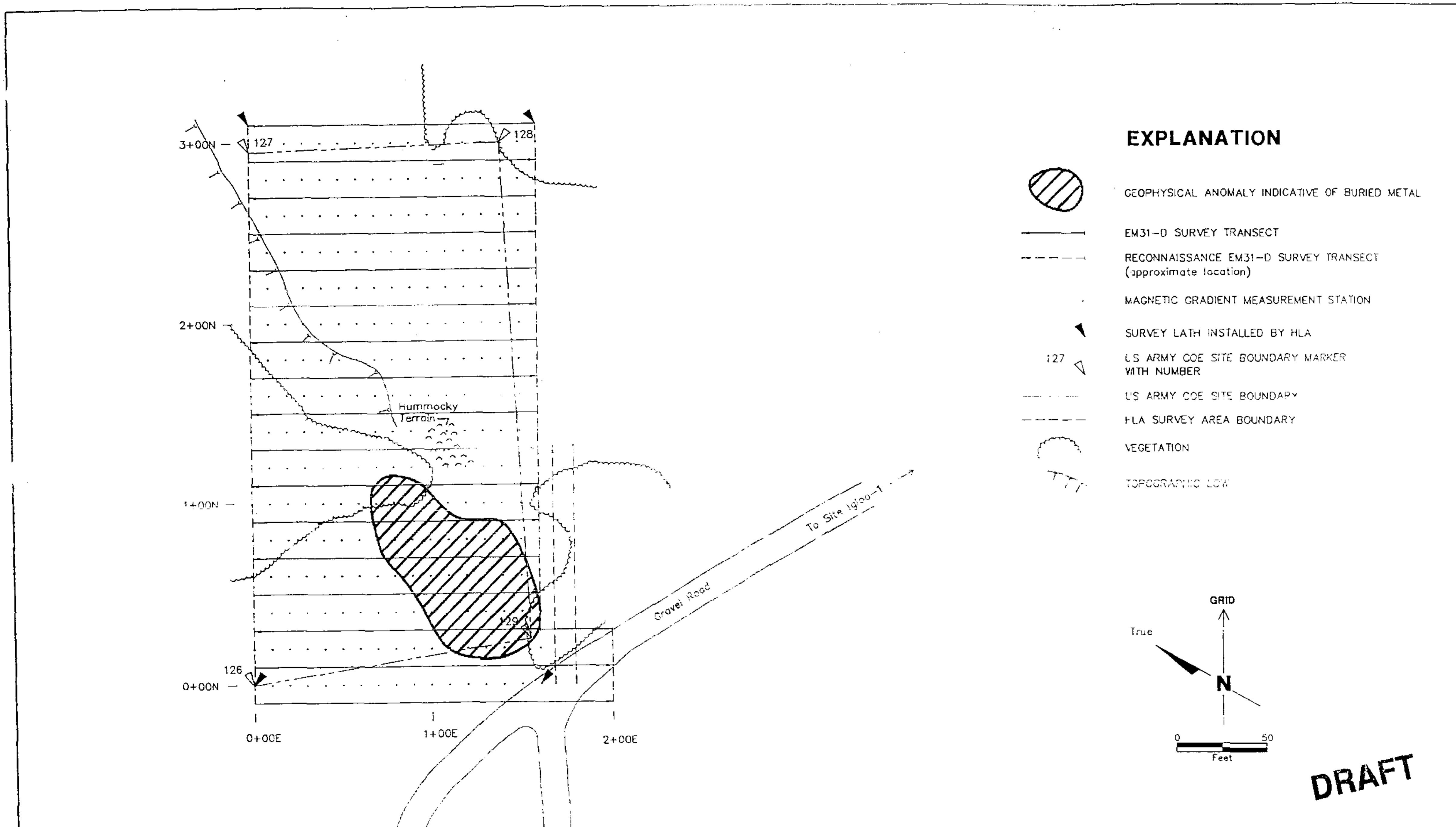
Geophysical Survey Coverage and Results
Site Igloo-1
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969,6		8/94	

IC1CR.DWG

9513540.2051



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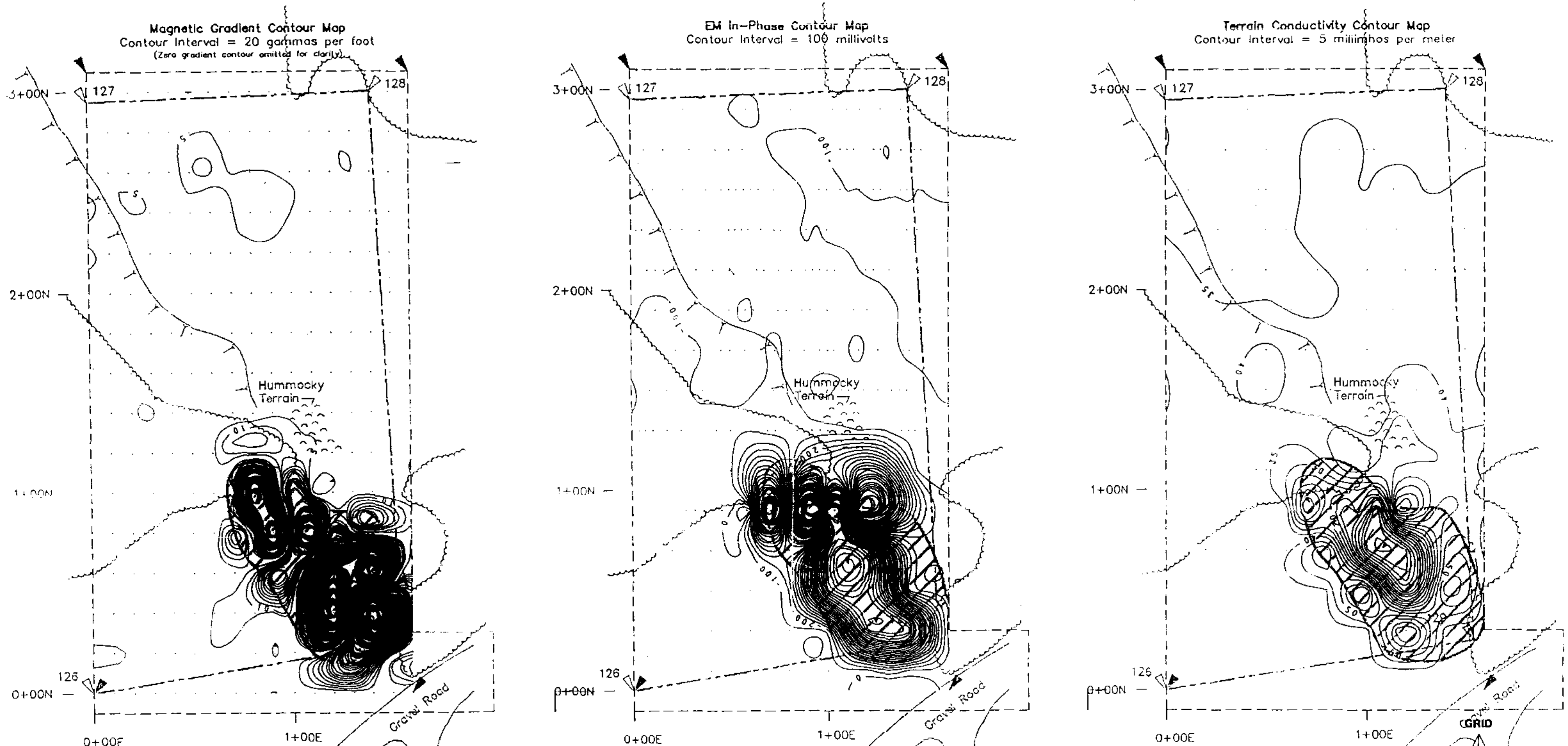
Geophysical Survey Coverage and Results
Site Igloo-2
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

IG2CR.DWG

9513346.2692



EXPLANATION

GEOPHYSICAL DATA POINT USED FOR CONTOURING

US ARMY COE SITE BOUNDARY AND LATH MARKER

HLA SURVEY AREA BOUNDARY AND LATH MARKER

GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL

VEGETATION

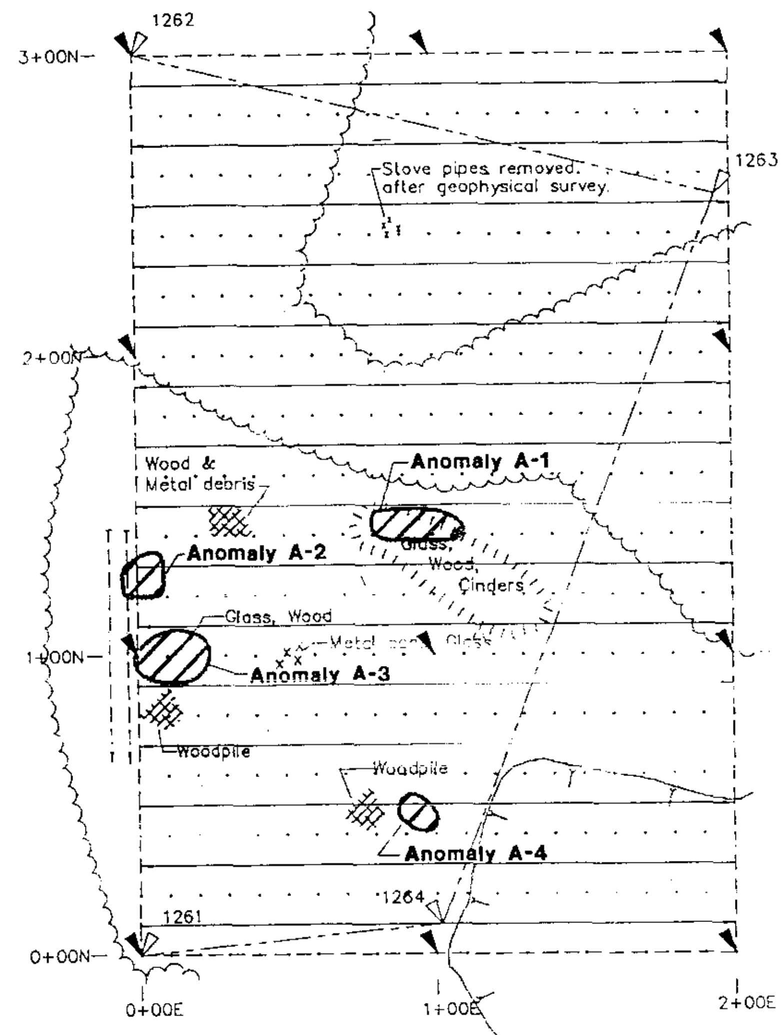
TOPOGRAPHIC LOW

DRAFT

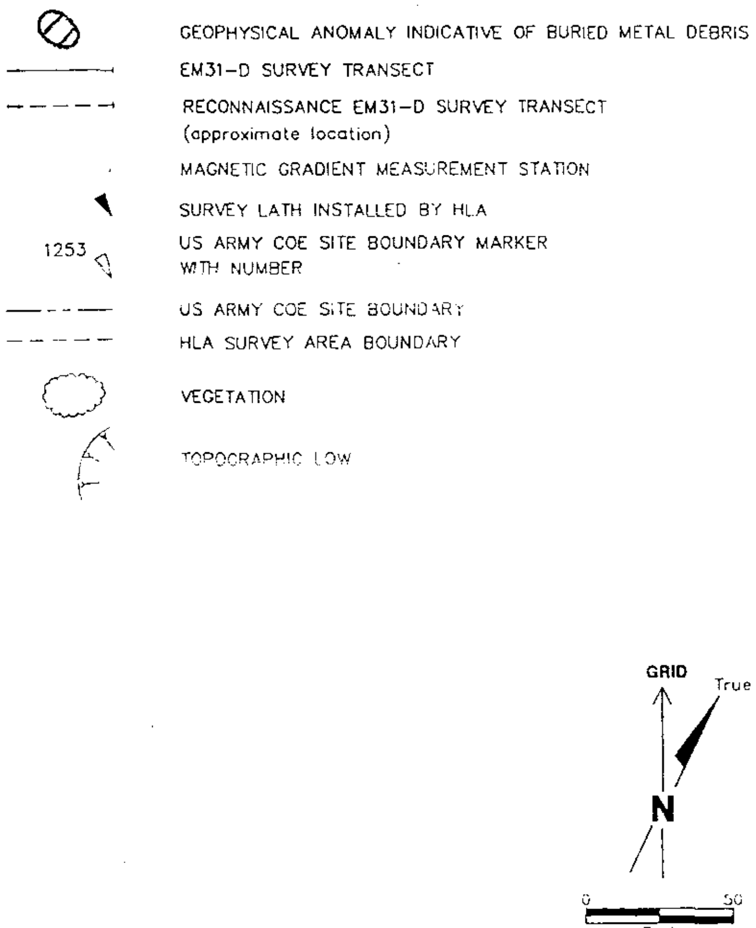
Harding Lawson Associates Engineering and Environmental Services	Contour Maps of Geophysical Datasets Site Igloo-2 CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington			PLATE 12
DRAWN PCB	JOB NUMBER 27969.6	APPROVED	DATE 8/94	REVISED DATE

IG2CON.DWG

9513346.2854



EXPLANATION



DRAFT

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Engineering and Environmental Services

Geophysical Survey Coverage and Results
Site Bridge Overview-1
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

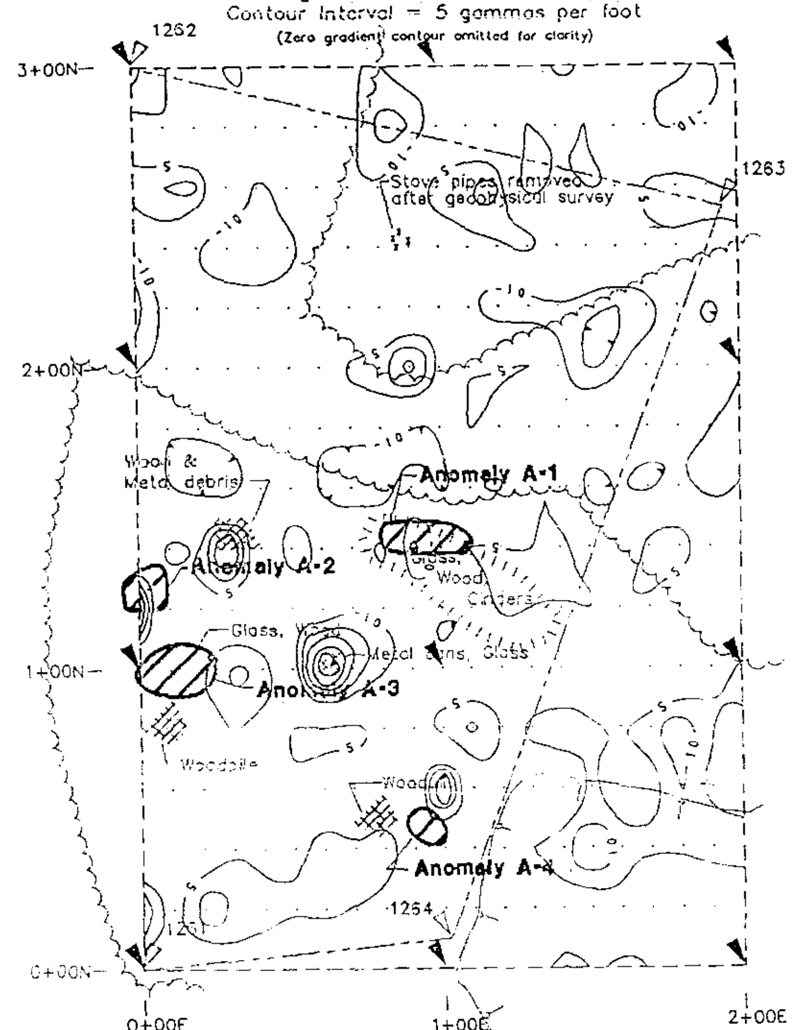
PLATE **13**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

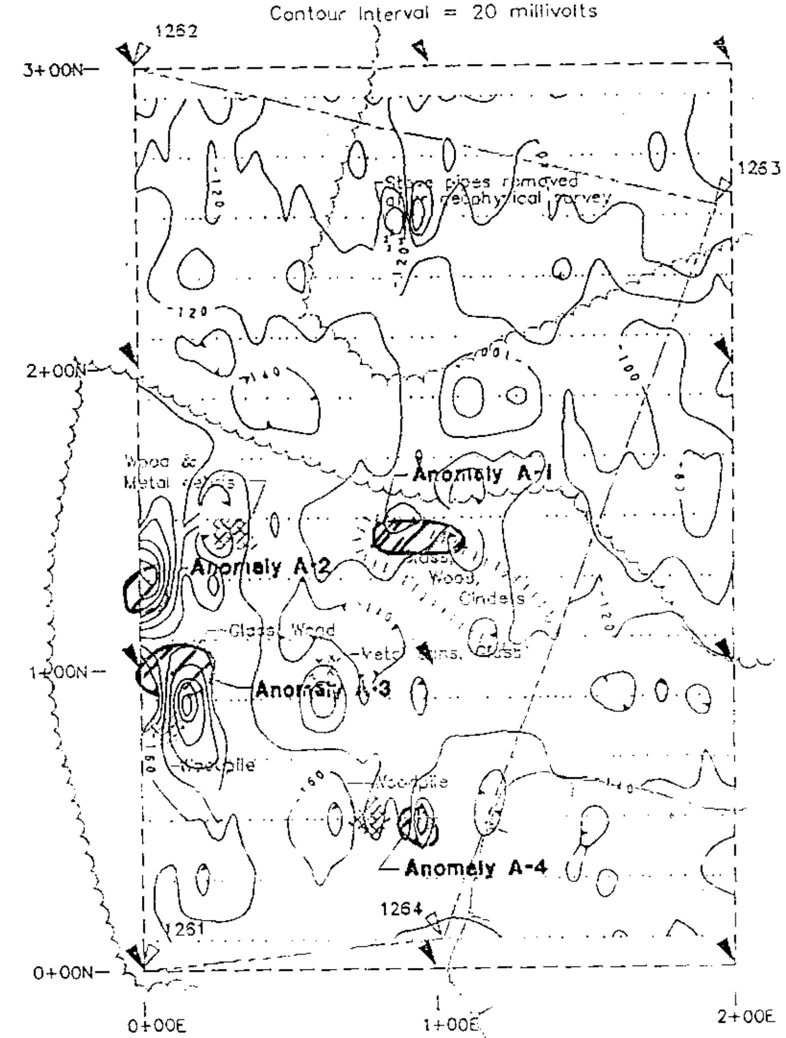
B01CR.DWG

9513346.2260

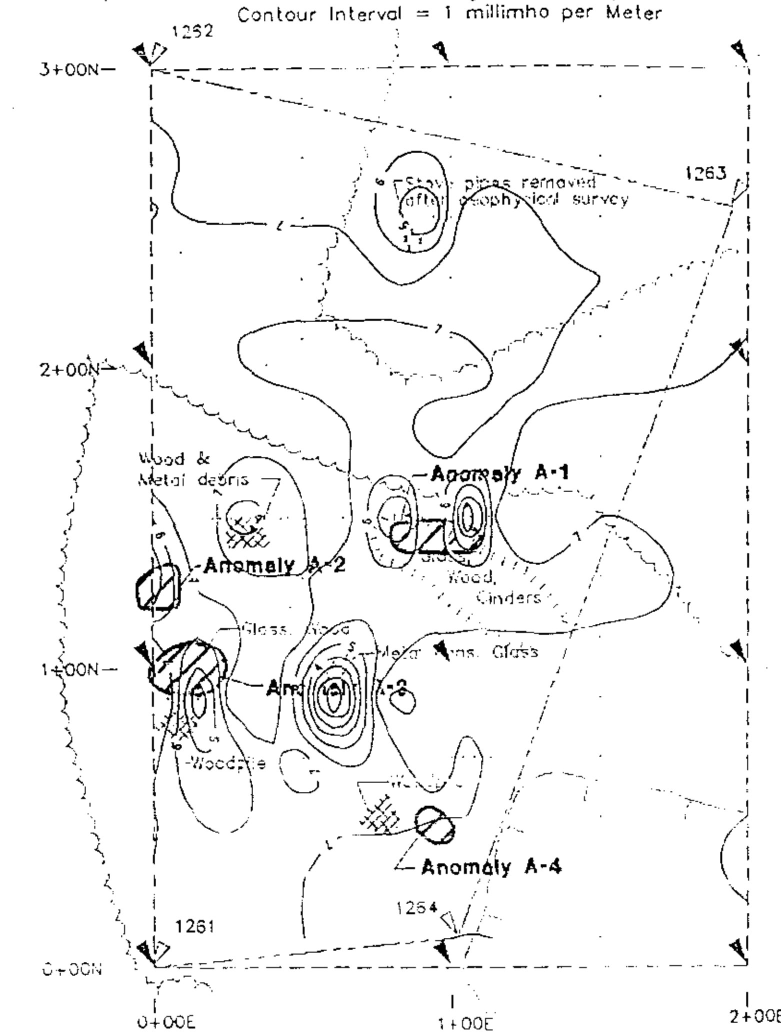
Magnetic Gradient Contour Map
Contour Interval = 5 gammas per foot
(Zero gradient contour omitted for clarity)



EM In-Phase Contour Map
Contour Interval = 20 millivolts



Terrain Conductivity Contour Map
Contour Interval = 1 millimho per Meter



EXPLANATION

GEOPHYSICAL DATA POINT USED FOR CONTOURING

1264 US ARMY COE SITE BOUNDARY AND MARKING LATH WITH NUMBER

HLA SURVEY AREA BOUNDARY AND MARKING LATH

GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL DEBRIS

VEGETATION

TOPOGRAPHIC LOW

GRID True N

0 50 Feet

DRAFT

Harding Lawson Associates
Engineering and Environmental Services

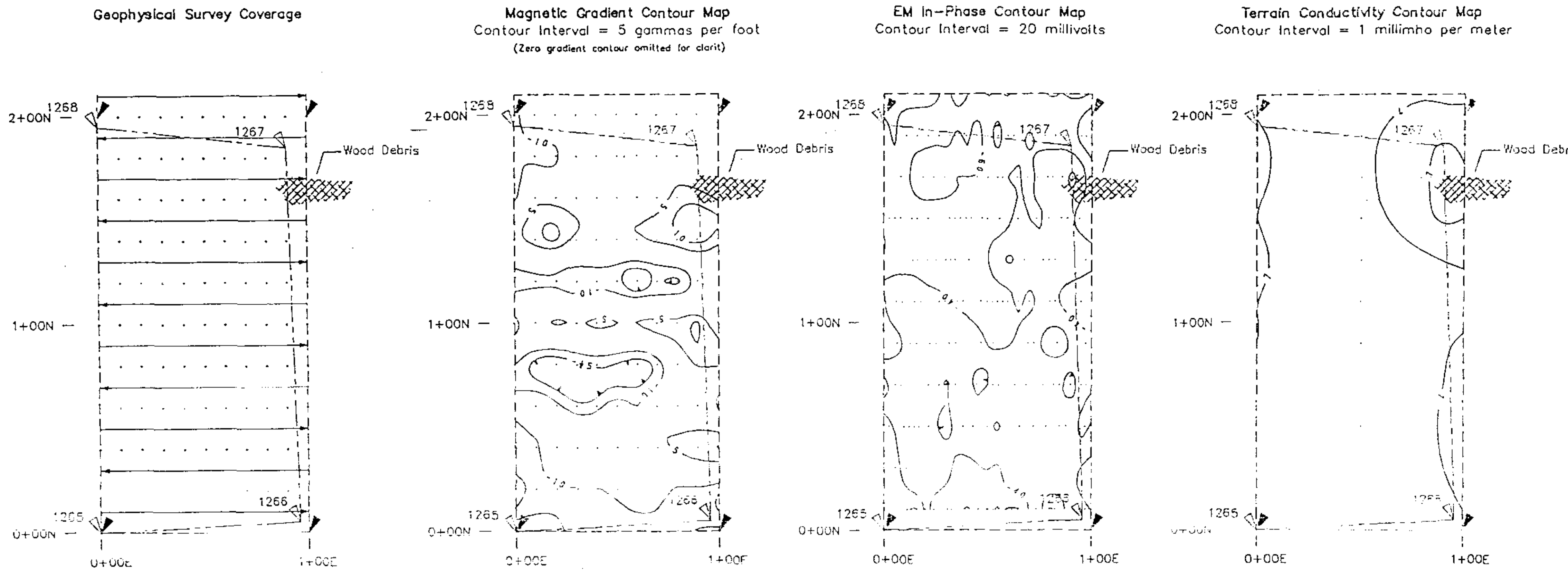
HLA

Contour Maps of Geophysical Datasets
Site Bridge Overview-1
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969,6		8/94	

801CONT.DWG



EXPLANATION

- EM31-D SURVEY TRANSECT
- MAGNETIC GRADIENT MEASUREMENT STATION
- DATA POINT USED FOR CONTOURING
- SURVEY LATH INSTALLED BY HLA
- 1265 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER
- US ARMY COE SITE BOUNDARY
- HLA SURVEY AREA BOUNDARY

NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE

N

DRAFT

0 50
Feet

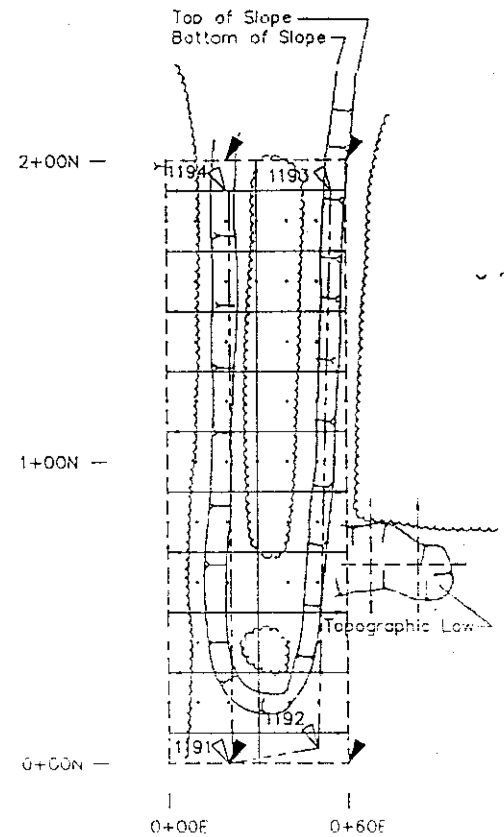
Harding Lawson Associates
Engineering and Environmental Services

Geophysical Survey Coverage and Results
Site Birdge Overview-2
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

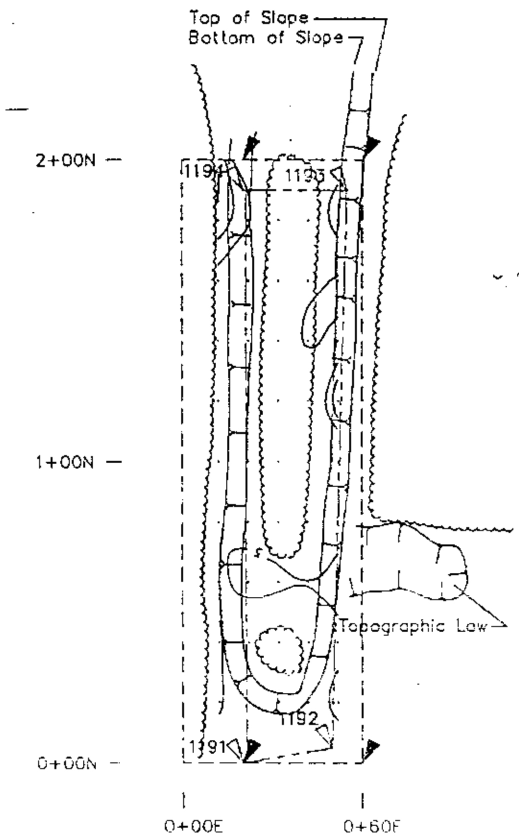
PLATE 15

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27969.6		8/94	

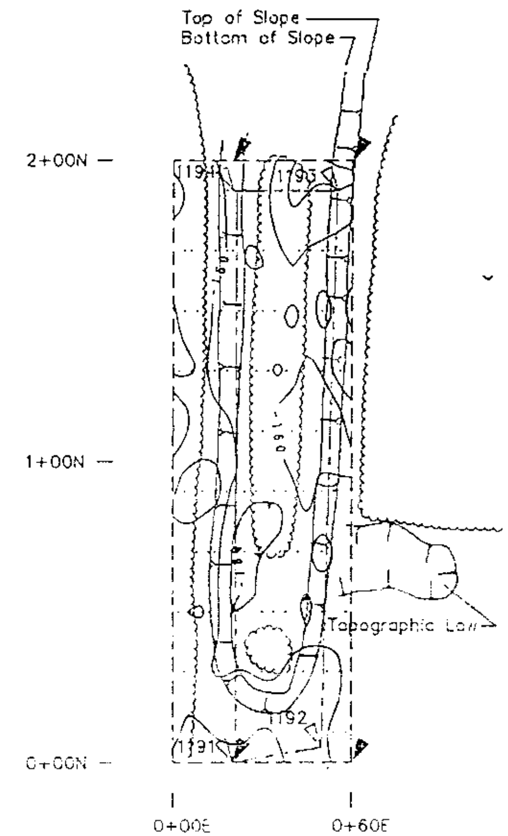
Geophysical Survey Coverage



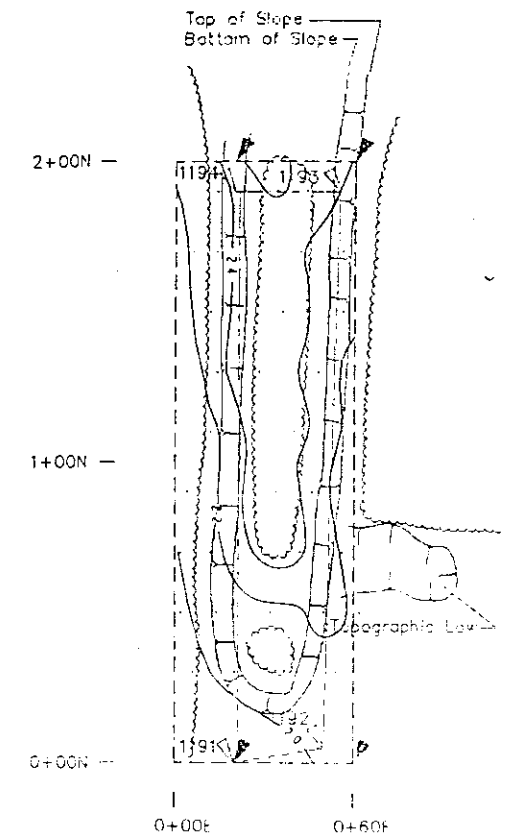
Magnetic Gradient Contour Map
Contour Interval = 5 Gammas per foot
(Zero gradient contour omitted for clarity)



EM in-Phase Contour Map
Contour Interval = 20 millivolts



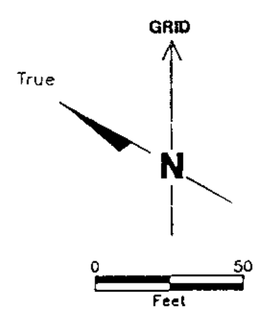
Terrain Conductivity Contour Map
Contour Interval = 2 millimhos per Meter



EXPLANATION

- EM31-D SURVEY TRANSECT
- RECONNAISSANCE EM31-D SURVEY TRANSECT
- MAGNETIC GRADIENT MEASUREMENT STATION
- DATA POINT USED FOR CONTOURING
- US ARMY COE SITE BOUNDARY
- HLA SURVEY AREA BOUNDARY
- SURVEY LATH INSTALLED BY HLA
- 1191 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER

NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE



DRAFT

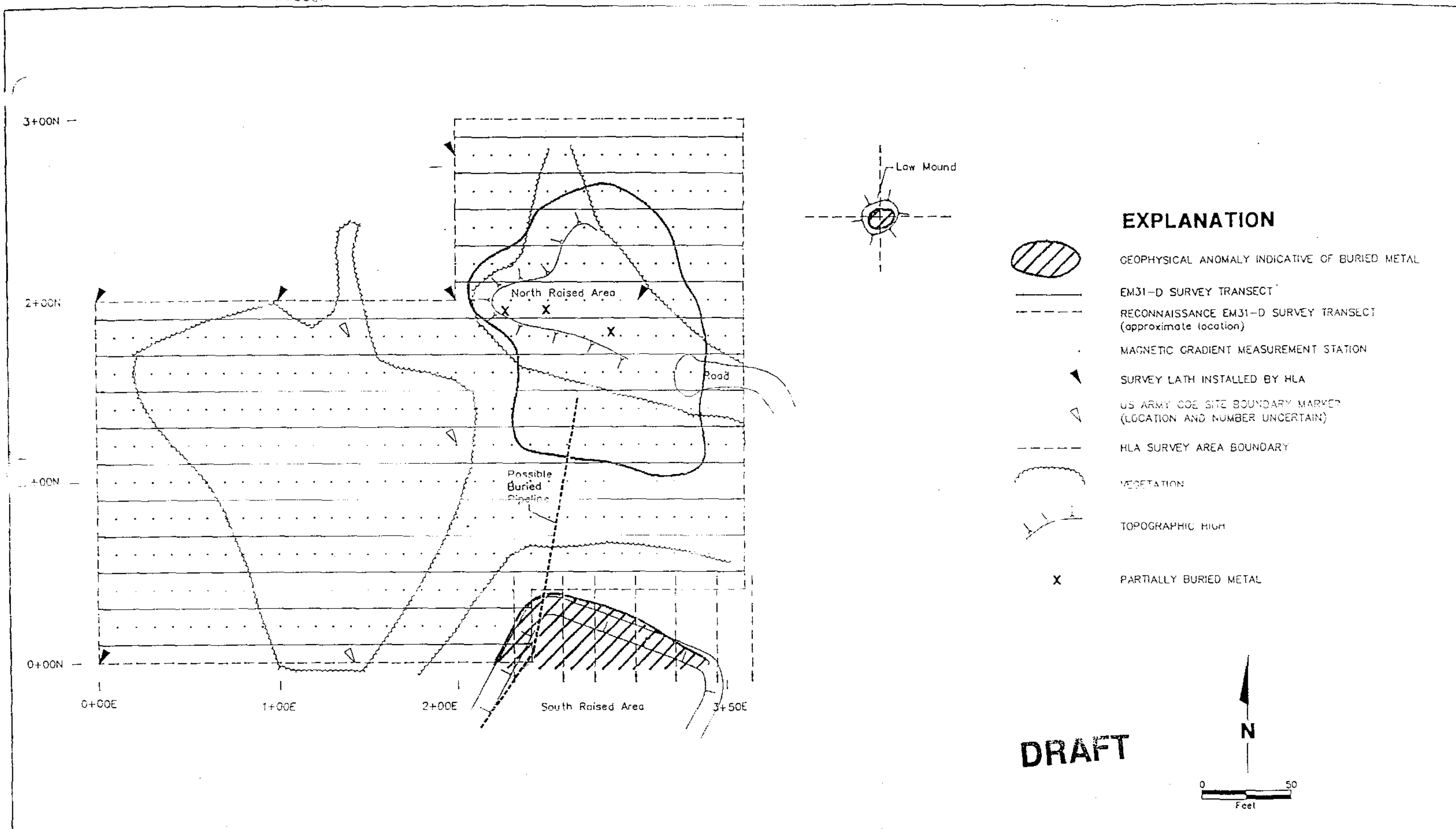
HLA
Harding Lawson Associates
Engineering and Environmental Services

Geophysical Survey Coverage and Results
Site H-12-C
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	27959,6		8/94	

9513346.2057



H83CCR.DWG

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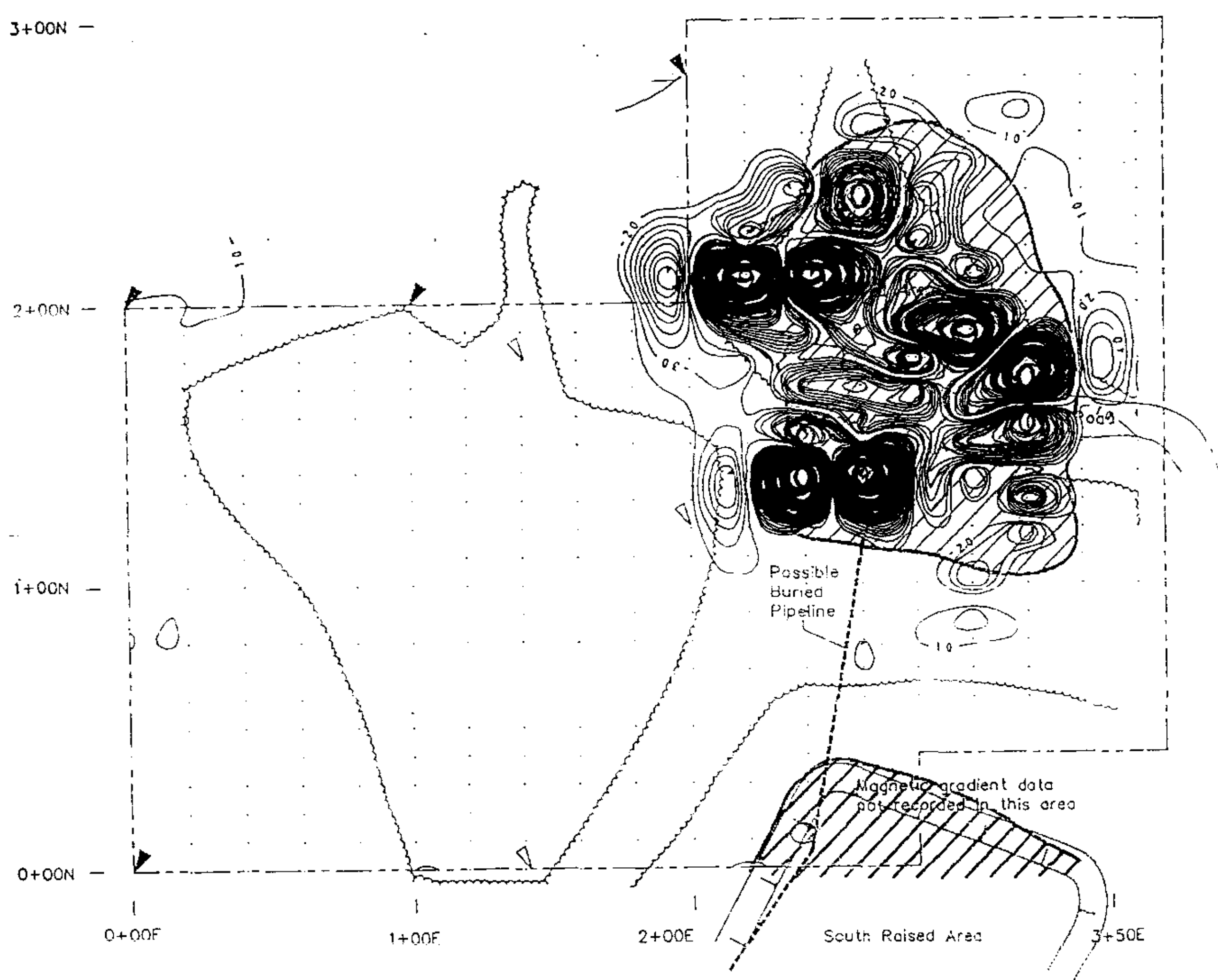
Engineering and Environmental Services

Geophysical Survey Coverage and Results
Site H-83-C
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE **17**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969 6		8/94	

9513346.2858



EXPLANATION

MAGNETIC GRADIENT CONTOUR
CONTOUR INTERVAL = 10 GAMMAS PER FOOT
(Zero gradient contour omitted for clarity)

MAGNETIC GRADIENT DATA POINT USED FOR CONTOURING

GEOPHYSICAL ANOMALY INDICATIVE OF BURIED METAL

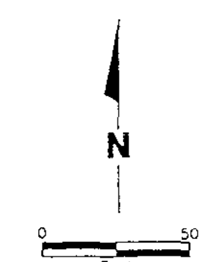
US ARMY COE SITE BOUNDARY MARKING LATH

HLA SURVEY AREA BOUNDARY AND MARKING LATH

VEGETATION

TOPOGRAPHIC HIGH

PARTIALLY BURIED METAL



DRAFT

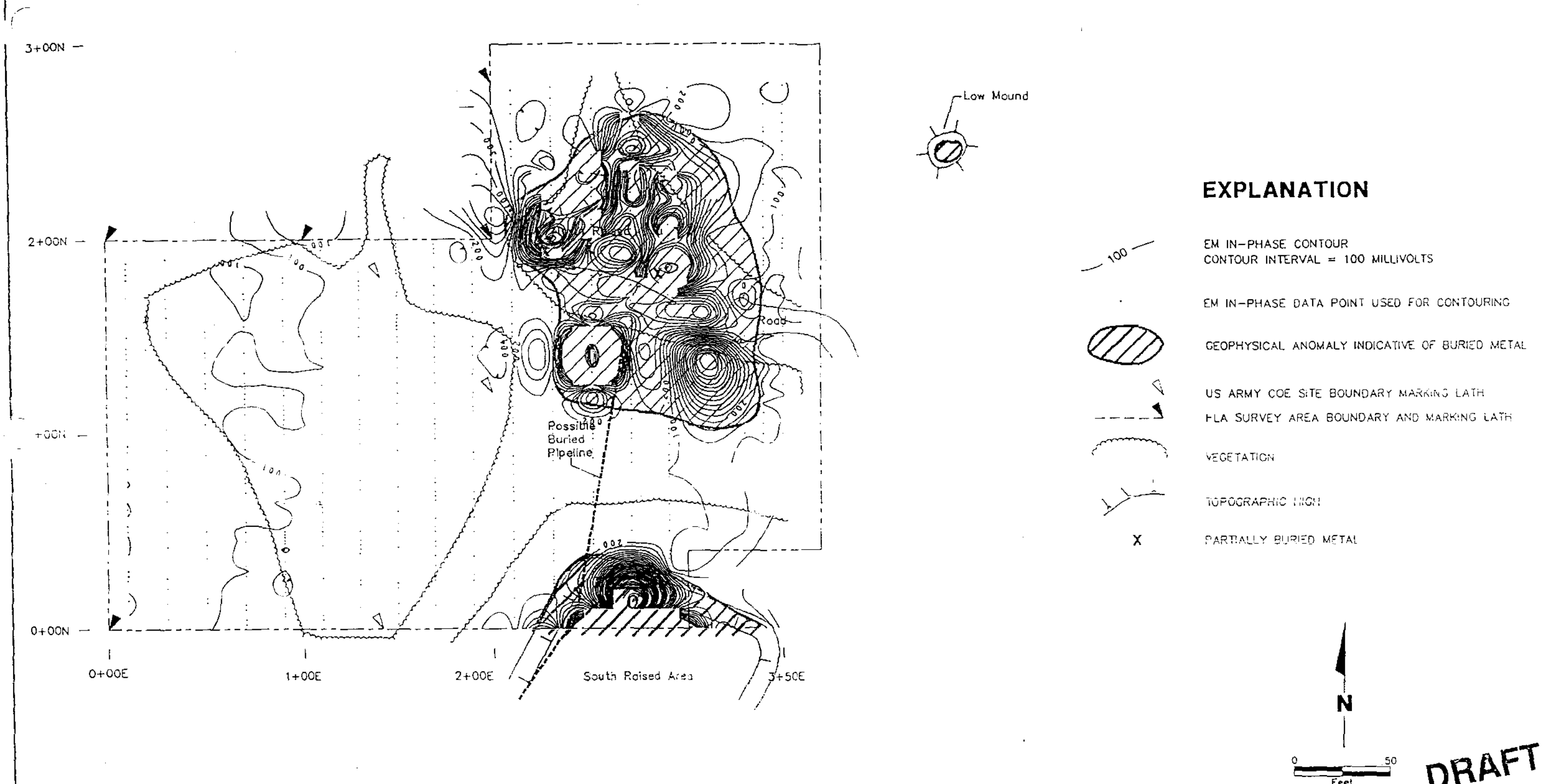
Harding Lawson Associates
Engineering and Environmental Services

Magnetic Gradient Contour Map
Site H-83-C
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969 6		8/94	

H83CM.DWG



Harding Lawson Associates
Engineering and Environmental Services

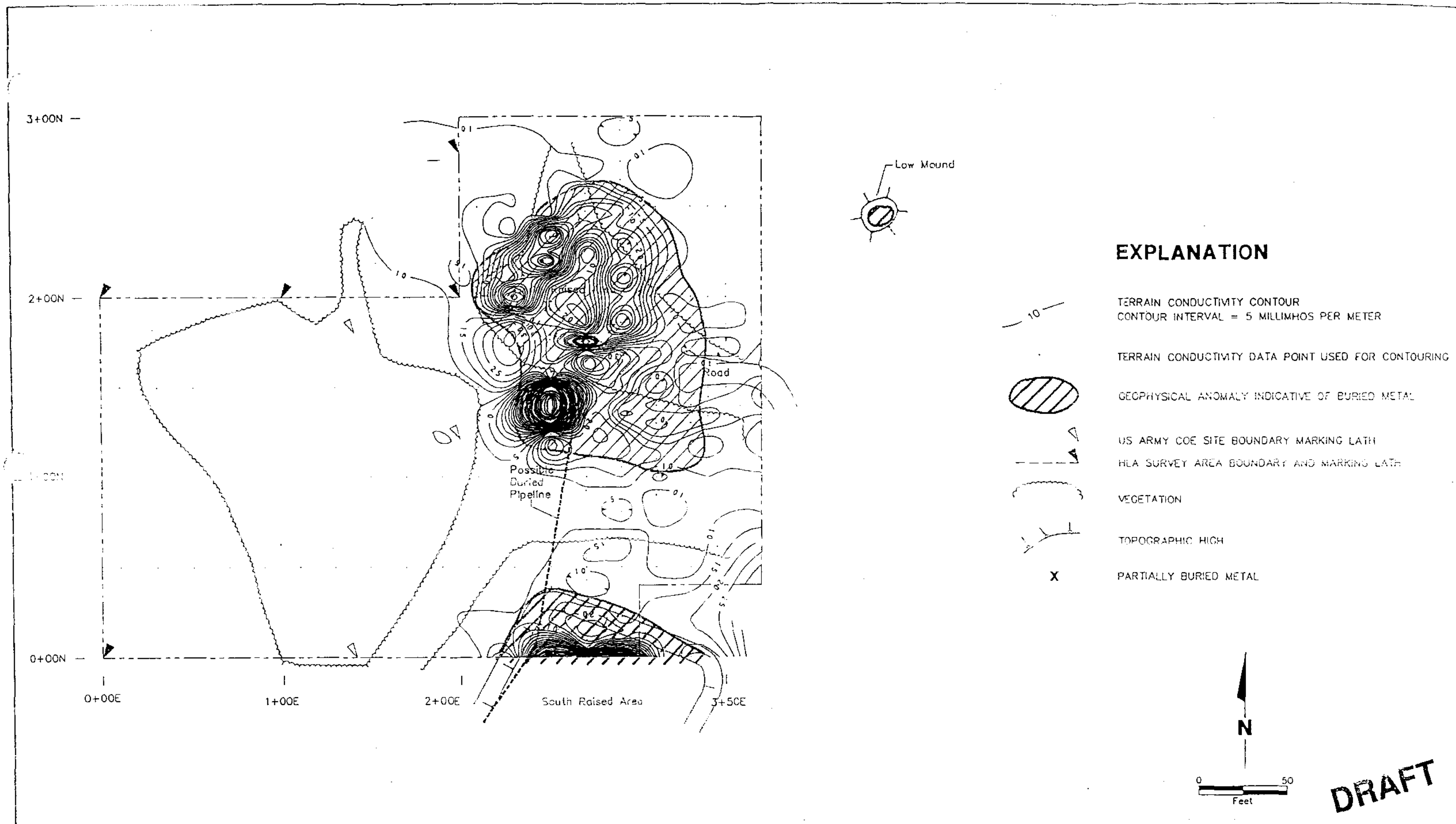
EM In-Phase Contour Map
Site H-83-C
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE 19

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969 6		8/94	

H83CI.DWG

9515546.2660

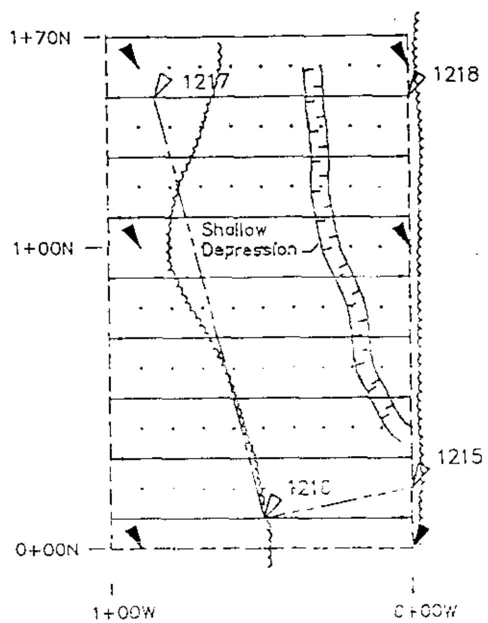


Harding Lawson Associates Engineering and Environmental Services	Terrain Conductivity Contour Map Site H-83-C CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington	PLATE **20**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969 6		8/94	

H83CC DWG

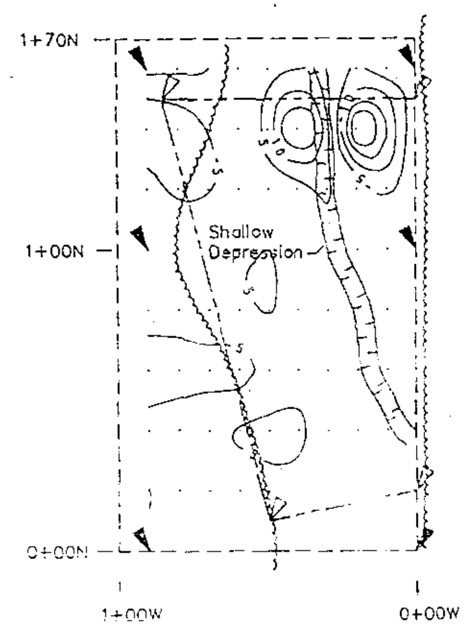
Geophysical Survey Coverage



Magnetic Gradient Contour Map

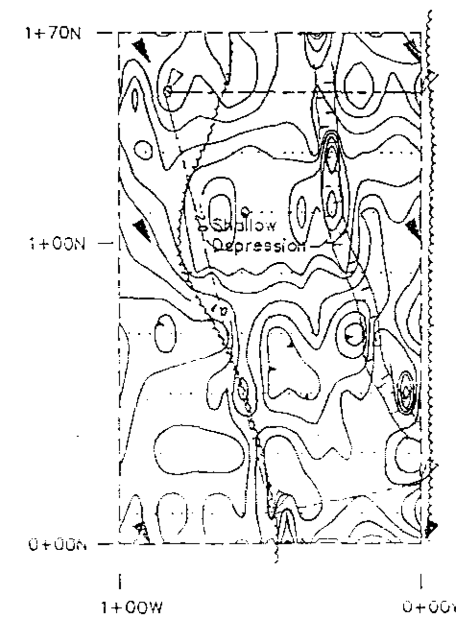
Contour Interval = 5 Gammas per foot

(Zero gradient contour omitted for clarity)



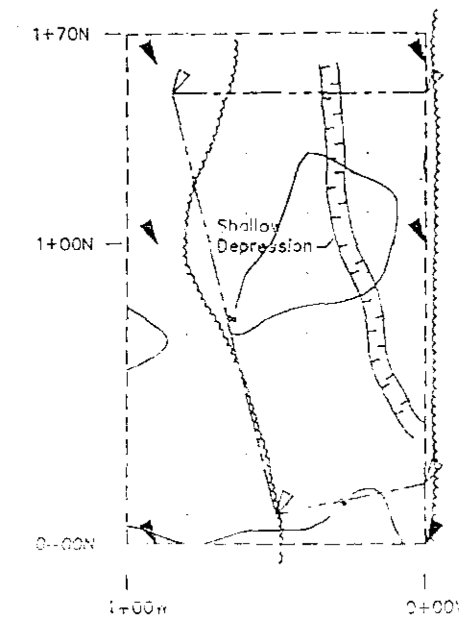
EM In-Phase Contour Map

Contour Interval = 20 millivolts



Terrain Conductivity Contour Map

Contour Interval = 1 millimho per Meter



EXPLANATION

EM31-D SURVEY TRANSECT

RECONNAISSANCE EM31-D SURVEY TRANSECT

MAGNETIC GRADIENT MEASUREMENT STATION

DATA POINT USED FOR CONTOURING

US ARMY COE SITE BOUNDARY

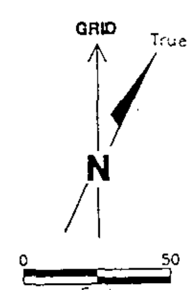
HLA SURVEY AREA BOUNDARY

SURVEY LATH INSTALLED BY HLA

1218 US ARMY COE SITE BOUNDARY MARKER WITH NUMBER

VEGETATION

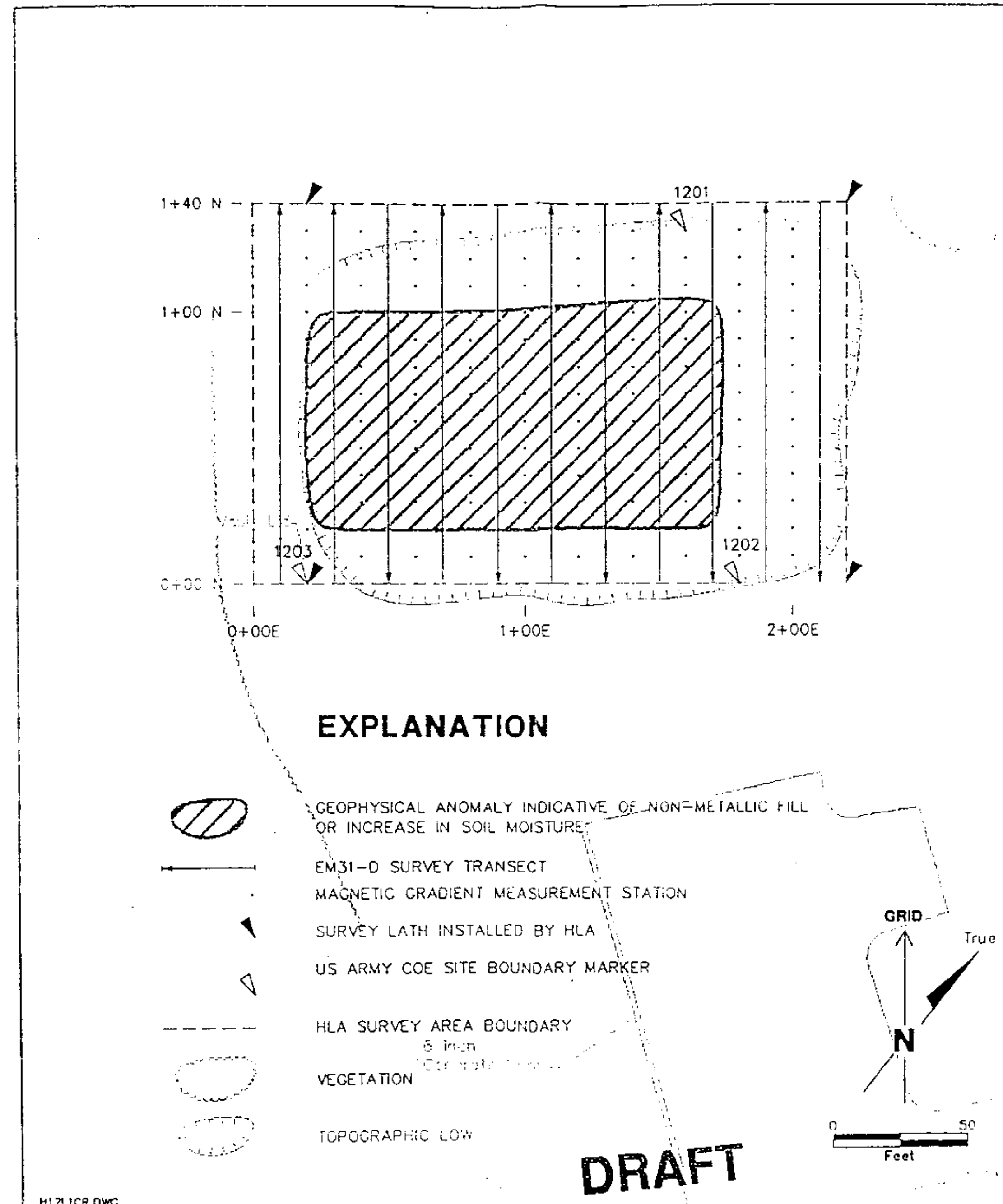
NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE



DRAFT

Harding Lawson Associates Engineering and Environmental Services		Results of Geophysical Survey Site PSN-01 CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington	PLATE 25
DRAWN PCB	JOB NUMBER 27969.6	APPROVED	DATE 8/94	REVISED DATE

9513346.2662



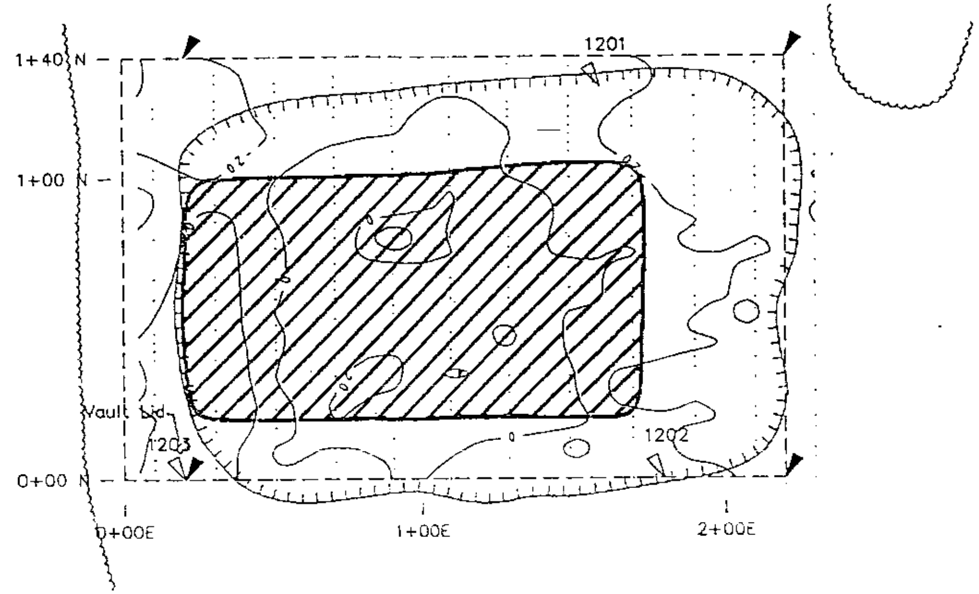
Harding Lawson Associates
Engineering and Environmental Services

Geophysical Survey Coverage and Results
Site H-12-L-1
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

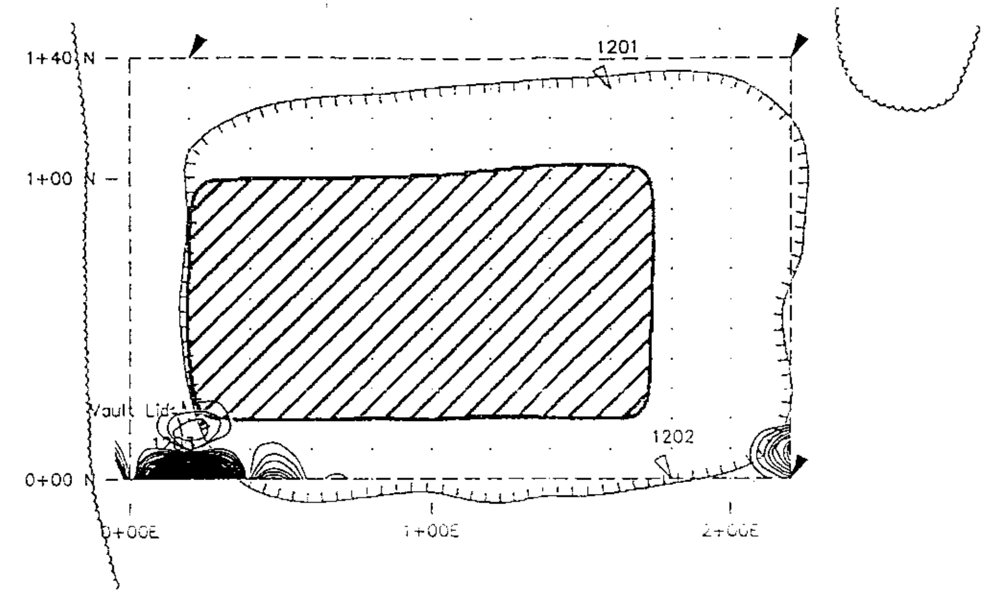
PLATE **26**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

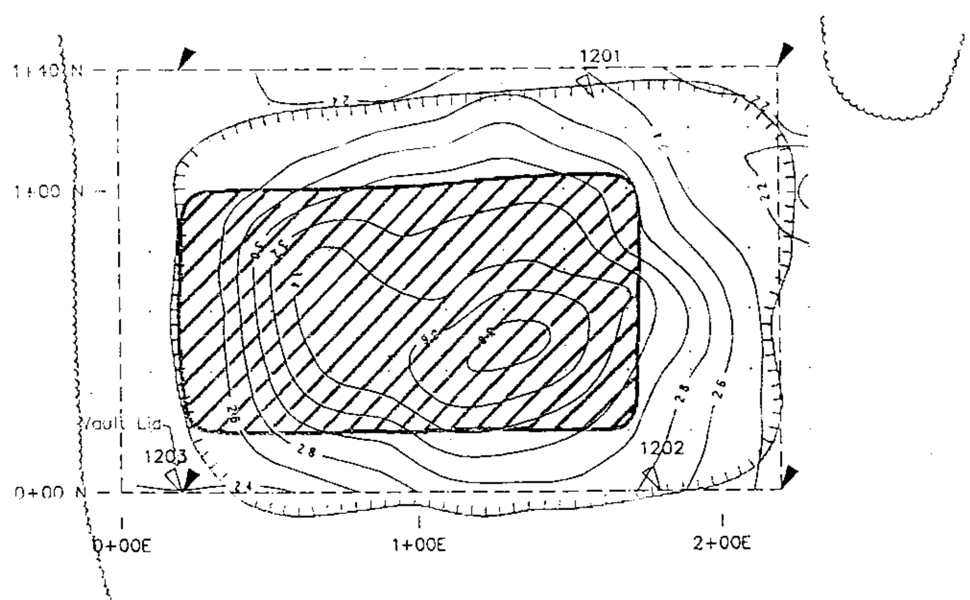
EM In-Phase Contour Map
Contour Interval = 20 millivolts



Magnetic Gradient Contour Map
Contour Interval = 2 gammas per foot
(Zero gradient contour removed for clarity)



Terrain Conductivity Contour Map
Contour Interval = 2 millimhos per meter



EXPLANATION

GEOPHYSICAL DATA POINT USED FOR CONTOURING

GEOPHYSICAL ANOMALY INDICATIVE OF NON-METALLIC DISPOSAL OR INCREASED SOIL MOISTURE

US ARMY COE SITE BOUNDARY AND MARKING LATH

HLA SURVEY AREA BOUNDARY AND MARKING LATH

VEGETATION

GRID
True
N

0
50
Feet

DRAFT

Harding Lawson Associates
Engineering and Environmental Services

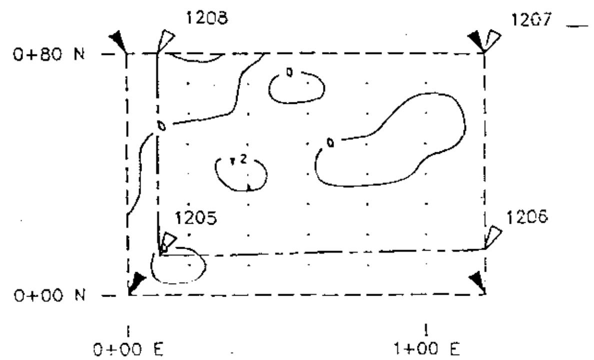
Contour Maps of Geophysical Datasets
Site H-12-L-1
CDM Federal Programs
Landfill Characterization and Remediation
Hanford North Slope, Washington

PLATE
27

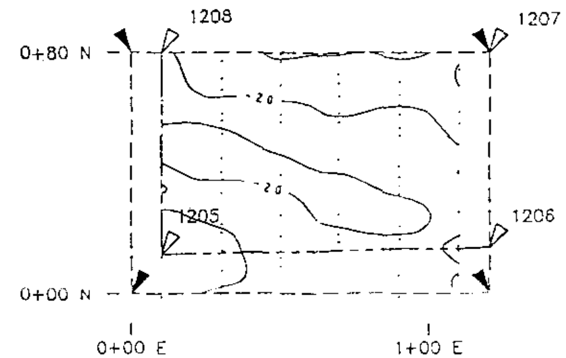
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	27969.6		8/94	

H12L1CONT.DWG

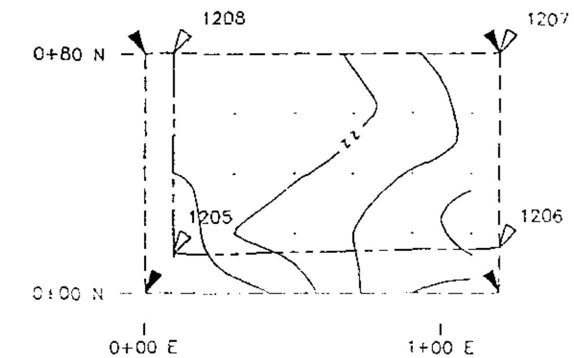
Magnetic Gradient Contour Map
Contour Interval = 2 gammas per foot
(Zero gradient contour removed for clarity)



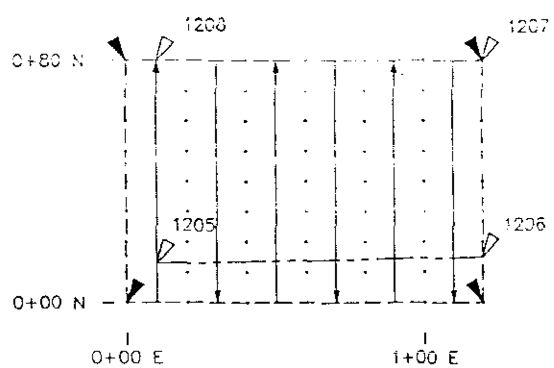
EM In-Phase Contour Map
Contour Interval = 20 millivolts



Terrain Conductivity Contour Map
Contour Interval = 1 millimho per meter



Geophysical Survey Coverage



EXPLANATION

EM31-D SURVEY TRANSECT

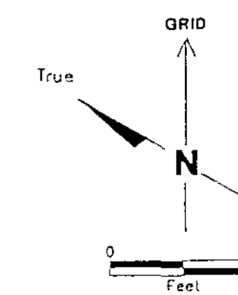
MAGNETIC GRADIENT MEASUREMENT STATION

GEOPHYSICAL DATA POINT USED FOR CONTOURING

1206 US ARMY COE SITE BOUNDARY AND MARKING LATH WITH NUMBER

HLA SURVEY AREA BOUNDARY AND MARKING LATH

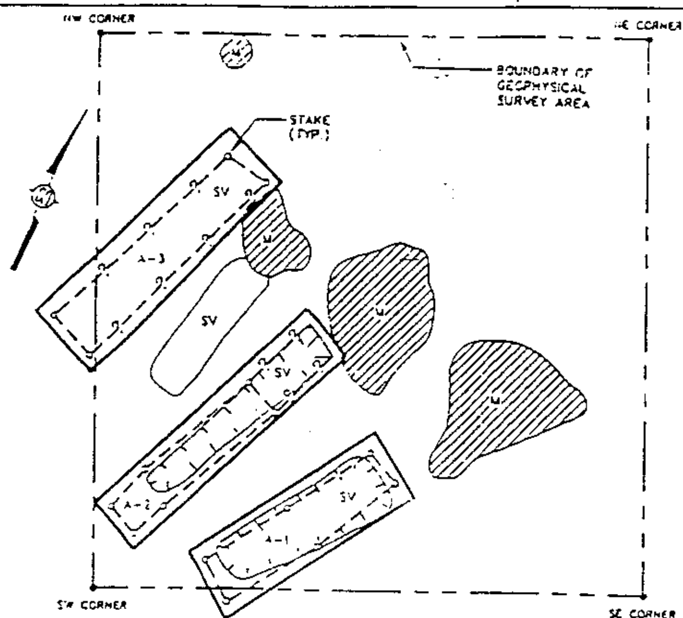
NOTE: NO GEOPHYSICAL ANOMALIES IDENTIFIED AT THIS SITE



DRAFT

Harding Lawson Associates Engineering and Environmental Services		Geophysical Survey Coverage and Results Site H-12-L-2 CDM Federal Programs Landfill Characterization and Remediation Hanford North Slope, Washington	PLATE 28
DRAWN PCB	JOB NUMBER 27969.6	APPROVED	DATE 8/94	REVISED DATE

H12L2CR.DWG

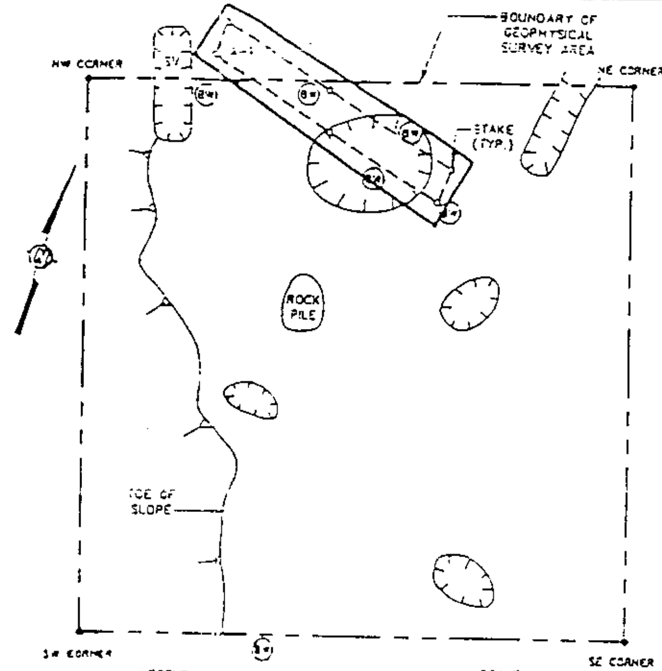


LEGEND:

- NW CORNER • STAKE MARKING CORNER OF GEOPHYSICAL SURVEY AREA
- (M) MOUND/SOIL STOCKPILE
- SURFACE DEPRESSION
- SV STRESSED VEGETATION
- [A-1] PIT OR TRENCH CONTAINING BURIED METALLIC/NONMETALLIC DEBRIS (QUERIED WHERE UNCERTAIN)

SCALE: 0 40 80 FEET

SITE MAP WITH GEOPHYSICAL INTERPRETATION SITE PSN-04 (WEST)
WAHLUKE (N) SLOPE

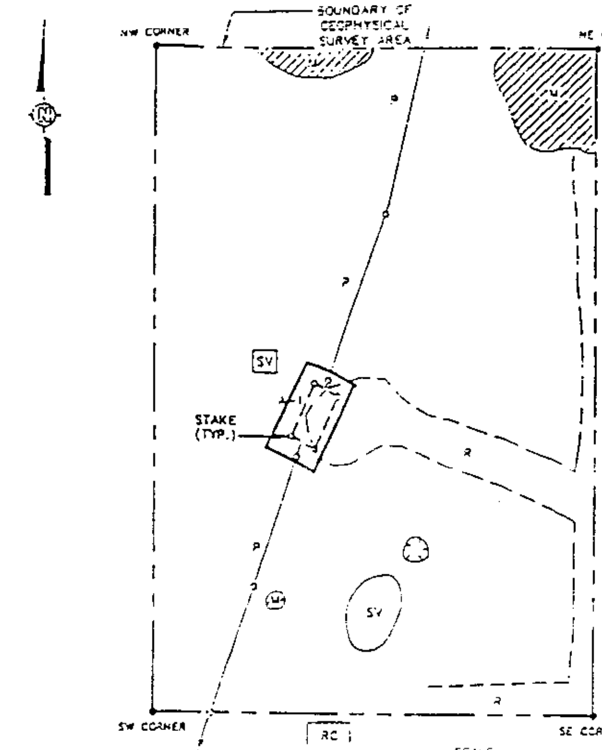


LEGEND:

- NW CORNER • STAKE MARKING CORNER OF GEOPHYSICAL SURVEY AREA
- SURFACE DEPRESSION
- (BW) BARBED WIRE
- SV STRESSED VEGETATION
- [A-1] PIT OR TRENCH CONTAINING BURIED METALLIC/NONMETALLIC DEBRIS

SCALE: 0 40 80 FEET

SITE MAP WITH GEOPHYSICAL INTERPRETATION SITE PSN-04 (EAST)
WAHLUKE (N) SLOPE

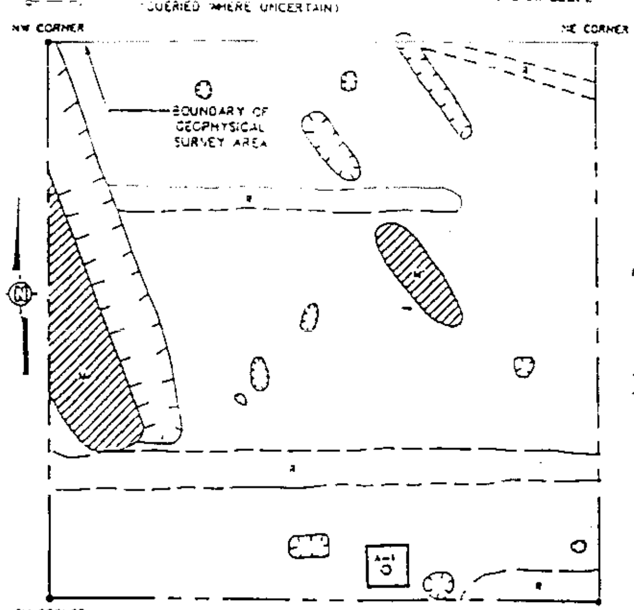


SCALE: 0 50 100 FEET

LEGEND:

- NW CORNER • STAKE MARKING CORNER OF GEOPHYSICAL SURVEY AREA
- (M) MOUND/SOIL STOCKPILE
- SURFACE DEPRESSION
- R DIRT ROAD
- P BURIED PIPE
- RC REINFORCED CONCRETE PAD
- SV STRESSED VEGETATION
- [A-1] BURIED METALLIC OBJECT (i.e., VAULT)

SITE MAP WITH GEOPHYSICAL INTERPRETATION SITE PSN-04 (SOUTH)
WAHLUKE (N) SLOPE



WORK AREAS

LEGEND:

- NW CORNER • STAKE MARKING CORNER OF GEOPHYSICAL SURVEY AREA
- (M) MOUND/SOIL STOCKPILE
- SURFACE DEPRESSION
- R DIRT ROAD
- A-1 BURIED METALLIC OBJECT

SCALE: 0 60 120 FEET

SITE MAP WITH GEOPHYSICAL INTERPRETATION SITE PSN-04 (NORTH)
WAHLUKE (N) SLOPE

SITE-NAME	STAKE NAME	NAD-83 METERS EASTING	NAD-83 METERS NORTHING	GEOGRAPHIC LATITUDE	GEOGRAPHIC LONGITUDE	GPS NUMBER
PSN-04-EAST	A-1-1	578,965.3113	157,415.0233	46 44 41.69	119 27 58.55	33
	A-1-2	578,992.1477	157,426.1321	46 44 41.58	119 27 58.38	34
	A-1-3	578,991.9436	157,420.1131	46 44 41.85	119 27 58.31	35
	NE-CORNER	579,021.5081	157,452.1557	46 44 42.07	119 27 56.88	36
	SE-CORNER	579,003.6758	157,369.8238	46 44 40.21	119 27 57.78	37
	SW-CORNER	578,909.1169	157,363.4615	46 44 40.01	119 27 58.65	38
	NW-CORNER	578,947.6417	157,416.4354	46 44 41.87	119 27 59.65	39
PSN-04-WEST	SW-CORNER	578,926.7905	157,433.0439	46 44 43.59	119 28 01.60	40
	A-1-1	578,933.6514	157,481.3077	46 44 43.93	119 28 01.81	41
	A-1-2	578,934.8057	157,510.0856	46 44 46.78	119 28 00.76	42
	A-1-3	578,943.3111	157,490.0032	46 44 44.13	119 28 00.94	43
	A-2-1	578,928.1641	157,484.2082	46 44 44.27	119 28 01.25	44
	A-2-2	578,921.1276	157,479.3310	46 44 43.79	119 28 01.45	45
	A-2-3	578,911.0728	157,475.7716	46 44 43.48	119 28 01.03	46
	A-3-1	578,910.7084	157,499.6464	46 44 44.66	119 28 01.07	47
	A-3-2	578,909.3218	157,500.4745	46 44 44.74	119 28 02.13	48
	NW-CORNER	578,886.4312	157,522.0796	46 44 45.19	119 28 03.20	49
	NE-CORNER	578,945.2744	157,538.6602	46 44 46.35	119 28 00.41	50
	SE-CORNER	578,975.7443	157,451.1961	46 44 44.33	119 27 59.01	51
PSN-04-SOUTH	SE-CORNER	578,660.6727	157,586.0665	46 44 47.29	119 28 13.63	52
	SW-CORNER	578,638.2066	157,601.2715	46 44 47.86	119 28 14.65	53
	NW-CORNER	578,632.1726	157,690.1274	46 44 51.00	119 28 15.07	54
	NE-CORNER	578,678.0241	157,693.8371	46 44 50.64	119 28 12.87	55
PSN-04-NORTH	SE-CORNER	578,669.8759	157,752.9979	46 44 52.76	119 28 13.18	56
	NE-CORNER	578,661.4009	157,837.8190	46 44 55.56	119 28 13.54	57
	NW-CORNER	578,579.3507	157,843.2221	46 44 55.73	119 28 17.46	58
	SW-CORNER	578,589.3564	157,776.5517	46 44 53.63	119 28 17.30	59

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

HANFORD-NORTH SLOPE
EXPEDITED RESPONSE ACTIONS
WORK PLANS & FIELD ACTIVITIES REPORTS
WAHLUKE SLOPE HABITAT UNIT
SITE PSN 04 (WEST, EAST, SOUTH & NORTH)
PHASE 2E & 2F - LANDFILL EXCAVATION

KADEN
KADEN
CHONG

2 HN-93-13/2

FIG. 2

951339K 2661

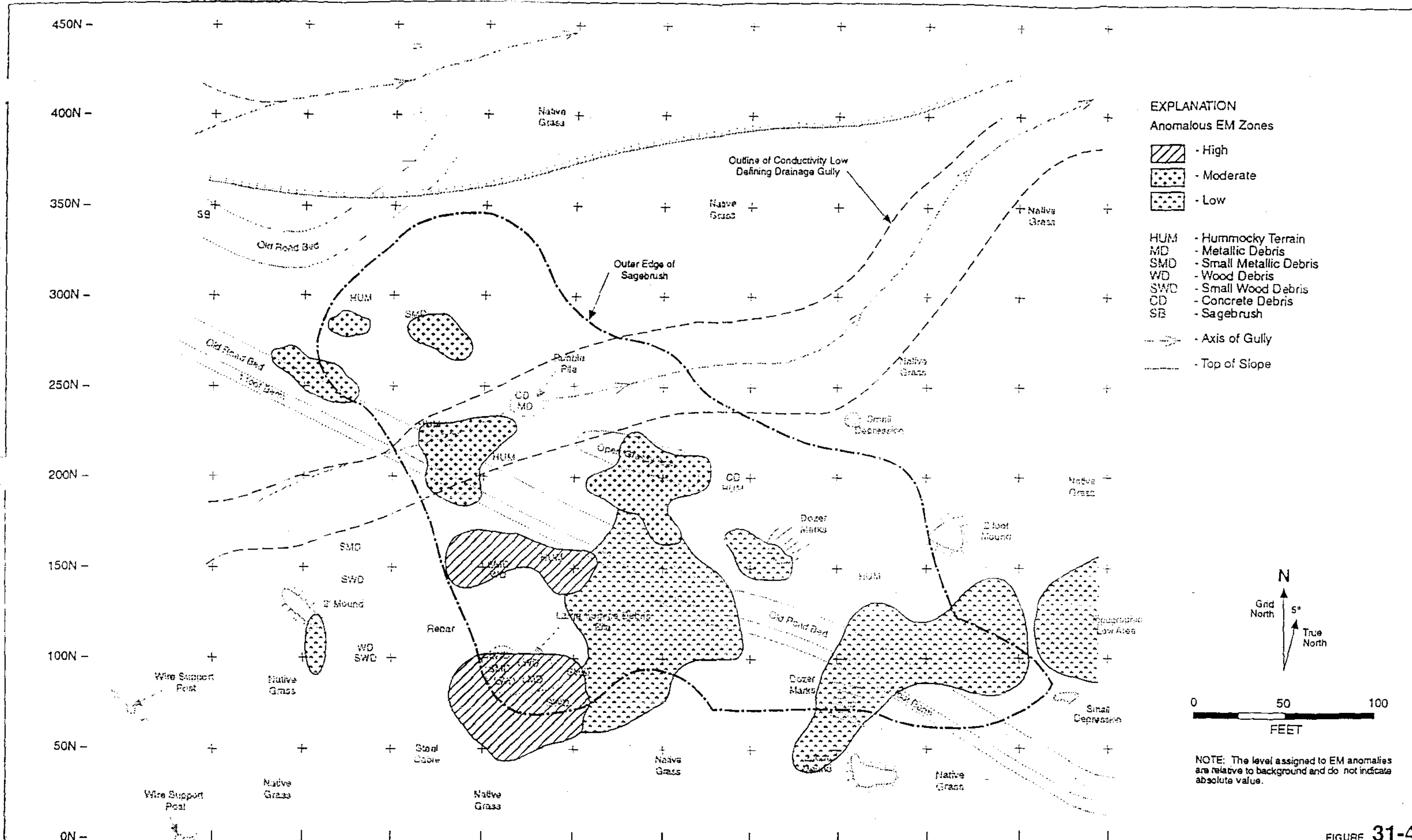
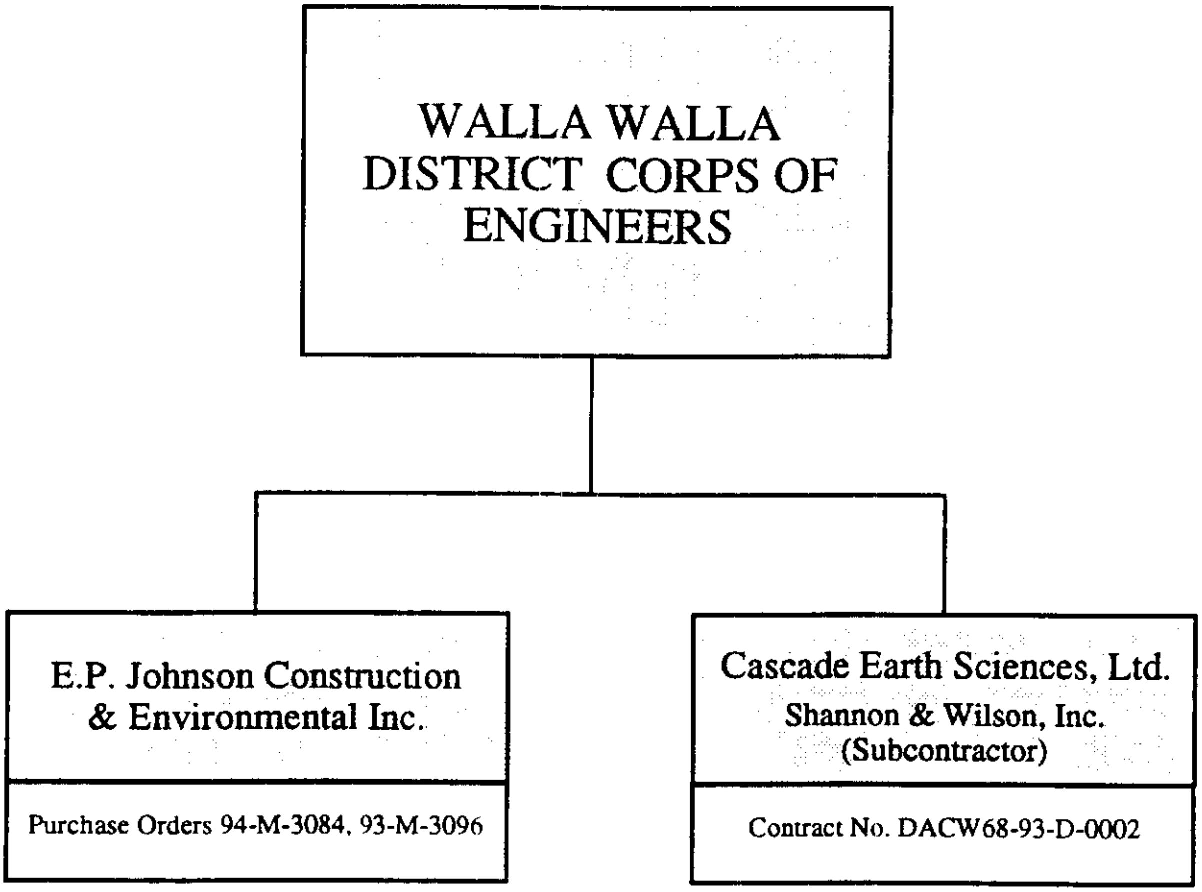


FIGURE 31-4
EM-31 INTERPRETATION MAP
H-52-L NIKE BASE LANDFILL
MW/1100 AREA RD/RA/WA

PROJECT NO. 943-1206.200 DRAWING NO. 50101 DATE 8/4/94 DRAWN BY TK

Golder Associates



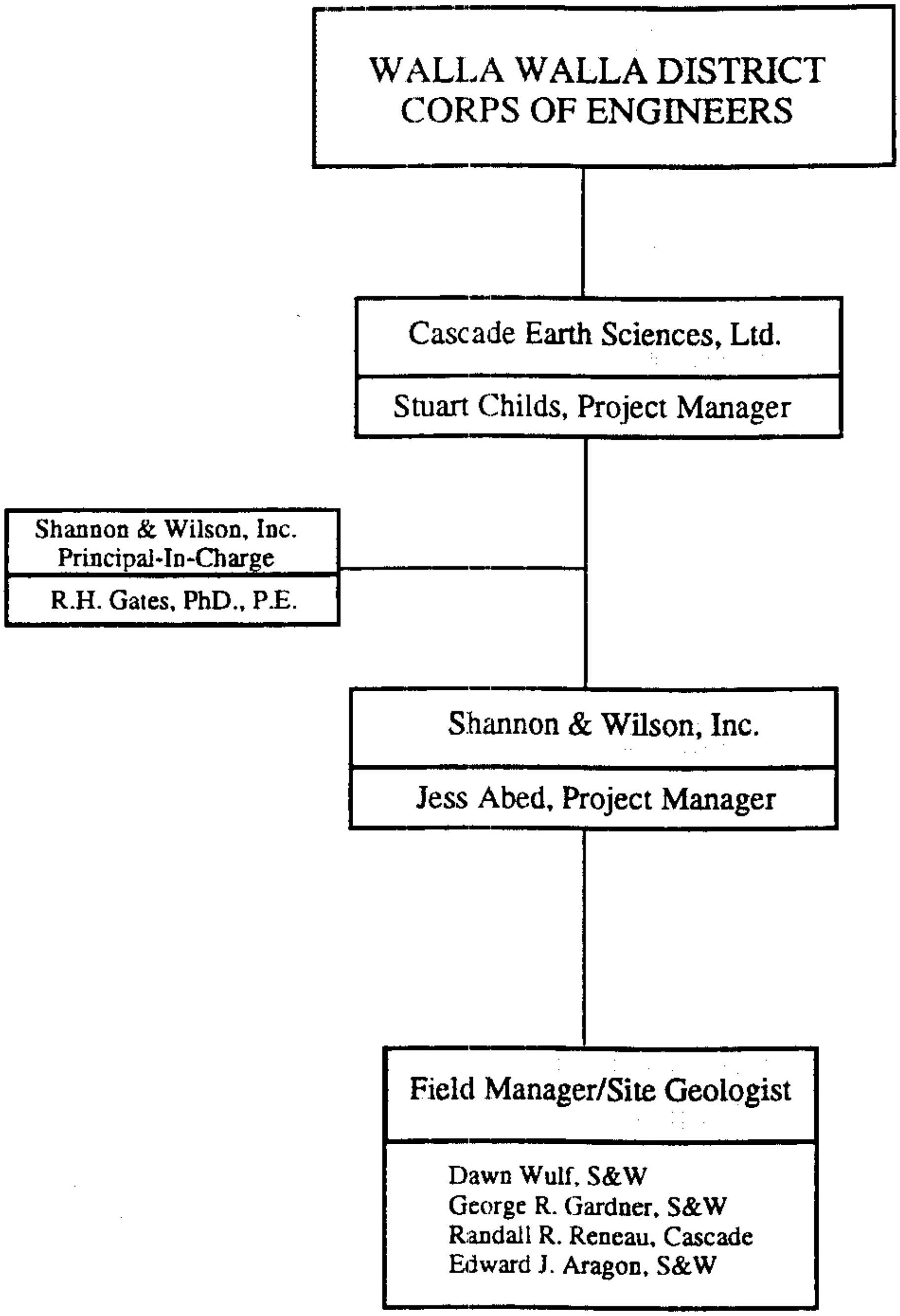
Expedited Response Action Phase I
Hanford-North Slope

Contract Organization

January 1994 V-0201-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2



Expedited Response Action Phase I
Hanford-North Slope

Project Organization

January 1994 V-0201-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

APPENDIX A

SITE STATUS REPORT

determined what the pipe is connected with; it may be a buried fuel tank (photo 33, Appendix B).

PSN 80 Site: The debris at this site included building materials, insulators, glass bottles, tin cans, cable, and other garbage. Five 55-gallon drums of contaminated soil were removed. Two septic tank openings were discovered at this site. These septic tanks were filled with 16 CY of concrete slurry under modification to the E.P. Johnson purchase order. Debris cleanup is complete.

WDOT Gravel Pit, No. 47 Site: The debris remaining at this site included building materials, glass bottles, tin cans, paint cans, cable, concrete, and other garbage in the far pit. The amount of debris to be removed exceeded the time remaining on the contacts. Contaminated soil also remains on this site pending disposal instructions.

PSN 90 Site: Site still contains contaminated soil along with a large amount of concrete rubble from the demolished grease rack, several concrete pads, and some large sections of buried building materials as directed by the contract documents. The debris removed at this site included building materials (asbestos shingles, concrete, and rebar), metal pipe, fence wire (barbed and mesh), and other garbage.

PSN 01 Site: Debris at this site included over a mile of barbed wire strung as a security fence around the site. Fencing removed also included a drop bar gate at the entrance to the site with two sections of 6" reinforced concrete pipe. A large amount of wood which had been used to construct gravel walkways was also removed. Debris removal is complete. NOTE: Although the well structure is mentioned in the proposed schedule, this site is mentioned no where else in contract documents.

Asphalt Batch Plant Site: Debris removal is **not** complete. The debris left on this site includes asphalt, concrete, sheet metal and other debris.

Clay Pit Cistern Site: Debris removal is complete. The debris at this site included glass bottles, tin cans, asbestos pipe, and other garbage. Filling the cistern took approximately 2 CY of pit-run gravel. The asbestos pipe was removed in accordance with Paragraph 7.4 of the approved Contractor Health and Safety Plan.

SITE STATUS REPORT

Bridge View Site: The debris at this site included building materials, wood, glass, wire mesh, and paper products. Debris removal as directed by the Corps is complete. Two large piles of wood have been made and these will be burned by the U.S. Fish and Wildlife Service at a later date.

Position (PSN) 72/82 Site: The debris at this site included a large amount of building materials such as bricks and railroad ties as well as bottles, cans, communications wire, cable, and other garbage. Debris clean-up complete except for an old trailer frame (photo ???, Appendix B). The septic tank received 39 CY of concrete slurry and is completely filled. Two rifle pits (bunkers), installed as security positions, were cleaned out and backfilled.

H-83-C Site: Debris removal is complete. The debris at this site included building materials, 20 tires, glass bottles, wire mesh, metal pipe, and other garbage. A septic tank opening was discovered at this site and was reported to the Corps for further action. Prior to the completion of work on December 22, 1993, this septic tank was filled with concrete slurry. A large metal door and eight sections of sheet metal wall were removed from this site.

H-81-R Site: The debris at this site included building materials (concrete debris and rebar), oil filters, metal pipes, glass bottles, tin cans, communications wire, and other garbage. Debris removal, except wood, is complete. Two large piles of wood have been made and these will be burned by the U.S. Fish and Wildlife Service at a later date. Contaminated soil was removed and disposed of at the Richland Landfill. A rifle pit (bunker) was cleaned out and backfilled.

H-83-L Site: Debris removal, except wood, is complete. The debris at this site included building materials, galvanized cables and rods, glass bottles, tin cans, communications wire, and other garbage. A large pile of wood has been made and this will be burned by the U.S. Fish and Wildlife Service at a later date. Per direction of the Corps, three bollards with approximately 1 cubic yard of concrete on the end of each, were left to be removed at a later date. Three septic tank openings were discovered at this site and reported to the Corps for further action. A metal pipe with a flange on one end was left buried on this site. It was not

Cow Cistern Site: Debris removal is complete. The debris at this site included glass bottles, tin cans, and other garbage. Filling the cistern took approximately 2 CY of pit-run gravel.

Wasteway Cistern Site: Debris removal is complete. The debris at this site included glass bottles, tin cans, cable, concrete, and other garbage. Filling the cistern took approximately 33 CY of pit-run gravel.

Igloo Site: The debris at this site included a stock watering drum, glass bottles, tin cans, barbed wire, and other garbage. Debris removal is complete.

PSN 04 Site: Debris removal is complete. The debris at this site included building materials, glass bottles, tin cans, barbed wire, and other garbage. Contractor removed approximately 200 lineal feet of 1-inch steel cable from this site.

H-06-L Site: Debris removal is **not** complete. The underground bunker was backfilled with 29 CY of slurry. The debris left on this site includes wire (mesh and barbed), concrete, sheet metal, and other debris.

PSN 07/10 Site: Debris removal is complete. The debris at this site included building materials, cable, glass bottles, tin cans, barbed wire, and bags of garbage collected by others.

H-12-L Site: Debris removal was not part of Phase I. The underground bunker was backfilled with slurry.

PSN 12/14 Site: Debris removal was not part of Phase I. The soil was excavated around the well structure.

Wagon Road Cistern: Debris removal is complete. The debris at this site included glass bottles, tin cans, and other garbage. Filling the cistern took approximately 10 CY of pit-run gravel.

Hanford Firing Range Point and Target Area Site: The only debris removed at this site were metal 55-gallon drums used as targets and other metal debris.

NOTE: No debris was removed from the Dune Homestead, Power Pole 12-3, Wagon Road, Lonetree Homestead, Overlook and Homestead, and the Coyote Bait Can sites.

APPENDIX B

FIELD REPORTS

DAILY QA REPORT

Date: November 4, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear to Partly Cloudy

Site Personnel: Richard Fink, Wendy Alenduff, Paul Ching (Corps); Klint Johnson, Ron Adams (E.P.Johnson).

Equipment: Pickup, Kubota Trackhoe with Trailer.

Work Performed:
E.P.Johnson unloaded trackhoe and excavated clean soil from around well structure at H-83C Site. Well structure was excavated to a depth of four feet below the top of well structure. Contractor E.P.Johnson finished up with excavation at the site and provided an access road into site.

Moved to the PSN 80 Site and contractor excavated soil from around well structure. Contractor encountered a section of soil that had been contaminated by some type of petroleum product. Richard Fink from the Corp informed Paul Ching to have contractor separate soil and place contaminated soil in a separate pile. Contractor finished with excavation and provided an access road to well structure.

Contractor E.P.Johnson with instruction from Paul Ching moved down to Bridge View Site and removed misc trash bags that had been filled with garbage and stacked by road L-SW.

Field Analysis Performed:(Instrument Checks,Calibrations)
None

Problems Encountered / Corrective Actions:
Contractor E.P.Johnson encountered an area of contaminated soil located next to well structure on the south side. Soil contamination appears to be a petroleum product and has cemented the soil on this side. The contractor removed all the loose soil from around the contaminated soil and then removed the contaminated soil and placed it in a separate pile so it could be disposed at a later date.

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: [signature]

DAILY QA REPORT

Date: November 5, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear to Partly Cloudy

Site Personnel: Paul Ching (Corps); Klint Johnson, Ron Adams (E.P.Johnson).

Equipment: Six Yard Dump Truck.

Work Performed:
E.P.Johnson arrived today with a dump truck and are planning to remove debris from Bridge View Site and PSN 72/82. Contractor started off day by removing misc garbage sacks that were stacked next to access gate at site PSN 72/82 and road L-SW. Contractor removed all debris at site and moved down to Bridge View Site and removed the remainder of debris that was collected and stacked by the Corp of Engineers next to road L-SW.

Contractor removed; metal stove pipes, barbed wire, rebar, sheet metal, hot water tank, scrap metal, 5-gallon cans, concrete, cable, tires, 55-gallon drum, and other misc garbage. The contractor also rolled out a 18 inch section of reinforced concrete pipe and left it by road L-SW. The contractor left two piles of wood debris and this debris will be burned at a later date by the U.S. Fish and Wildlife Service.

Contractor is disposing of debris at the Richland Landfill. Contractor finished up the day removing debris from site PSN 72/82.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered / Corrective Actions:
Contractor E.P.Johnson encountered problems in the loading of the 18 inch reinforced concrete pipe. The section of pipe will be left until contractor brings out a loader.

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward [signature]

Daily QA Report

Date: November 8, 1993

Project Name: Expedited Response Action, Phase I   Project Number: V-0201-01

Project Location: Hanford-North Slope

Sampling Personnel: George R. Gardner

Weather Conditions: 27.2 °F, wind 7 knots out of the West, very foggy.

Observations/Comments: Personnel on site: Randy Reneau (CES); Klint Johnson & Ron Adams (E.P. Johnson); Rick Fink, Wendy Alenduff, Claude Huckins, & Dave Opbroek (Corps)

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
93-CPC-S1-S0	Clay Pit Cistern	Soil	At stake near can
93-CPC-S2-S0	Clay Pit Cistern	Soil	At stake near can, QA
93-CC-S1-S0	Cow Cistern	Soil	At stake near cistern
93-P47-S1-S2	WDOT Pit No. 47	Soil	Stained soil site 1
93-P47-S2-S2	WDOT Pit No. 47	Soil	Stained soil site 1, QA
93-P47-S3-S1	WDOT Pit No. 47	Soil	Stained soil site 2
93-P47-S4-S0	WDOT Pit No. 47	Soil	Stained soil site 2
93-H81R-S1-S0	H-81R Site	Soil	At stake near wooden box
93-H81R-S2-S0	H-81R Site	Soil	At stake near wooden box
93-H81R-S3-S0	H-81R Site	Soil	At stake near wooden box
93-H81R-S4-S0	H-81R Site	Soil	At stake near wooden box
93-PSN90-S1-S0	PSN 90 Site	Soil	Soil stockpile
93-PSN90-S2-S0	PSN 90 Site	Soil	Soil stockpile
93-PSN90-S3-S2	PSN 90 Site	Soil	From bottom of excavation
93-PSN90-S4-S2	PSN 90 Site	Soil	From bottom of excavation

Work Performed:
E.P. Johnson unloaded their trackhoe and prepared to excavate soil from Stained Soil Site 1, however they had no visqueen and had to call back to Pasco to get some. This delayed excavation for about two hours. Took surface samples from this stained soil site and performed Hanby™ test, initial sample was black, this is off scale, took 10% dilution and reran test, reading was 770 mg/kg of motor oil in the second sample or 7700 mg/kg in the original sample.

Daily QA Report

Left gravel pit and proceeded to the Clay Pit and Cow Cisterns and took samples.

Returned to gravel pit at 12:50 and E.P. Johnson had completed excavations. Took four samples and performed a Hanby™ test on clean layer under Stained Soil Site 2, reading was 200 mg/kg.

Left gravel pit and moved to H-81R Site and took four samples (see above) left site at 2:45 PM and drove to PSN 90. Took samples from stockpile and from bottom of excavation. Completed sampling at 4:00 PM.

Field Analysis Performed: (Instrument checks, Calibration)
Hanby™ tests on soil from two stained soil sites.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
Only problem was that the initial concentration of motor oil at Stained Soil Site 1 was above sensitivity of the Hanby™ Kit and required dilution.

Quality Control Activities Conducted:
Sampler took two quality control samples one at the Clay Pit Cistern and one at the WDOT Pit No. 47.

Levels of Personnel Protection Used During Field Work:
Sampler was at Modified Level D during sampling at gravel pit, clay pit cistern, cow cistern, and PSN 90. Sampler went to Modified Level C at H-81R because field screening by Corps personnel had indicated the potential for PCB contamination.

George R. Gardner
Senior Environmental Engineer

DAILY QA REPORT

Date: November 9, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear to Partly Cloudy, Windy.

Site Personnel: Richard Fink, Wendy Alenduff, Claude Huckins (Corps); Klint Johnson, Ron Adams (E.P.Johnson); Randy Reneau (Cascade).

Equipment: Six Yard Dump Truck,misc hand tools.

Work Performed:
E.P.Johnson arrived today and began to remove debris from site PSN 72/82. Contractor removed communication wire, tin cans, bottles, burlap sacks, paint cans, wood debris, cable, barbed wire, and other misc garbage. Contractor found and disassembled two small rifle pits, the rifle pits were then filled in with soil. One rifle pits contained a 15 gallon drum of grease which was partially filled with water. The contractor removed the drum by replacing the lid and digging it out. The drum was then moved out on the asphalt road.

Contractor finished up removing debris from site PSN 72/82 north of road L-SW. Contractor did not finish up on the south side today because of the amount and size of material located a distance off of the road.

Contractor E.P.Johnson moved to site H-83C and removed 20 tires, sheet metal, communication wire, bottles, wood, tin cans, and other garbage. Contractor is disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered/Corrective Actions:
No problems encountered. Contractor found an additional septic tank, site was marked, and Claude from the Corps was informed and shown the site.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: November 10, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins, Mike Mahoney (Corps); Klint Johnson, Bill Neylan (E.P.Johnson); Randy Reneau (Cascade).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
E.P.Johnson arrived today and began to remove rebar by digging down at least 4 inches and cutting it with a hacksaw. Contractor had one man cutting rebar and the other was removing about 800 feet of communication wire. The contractor also removed signs that were mounted on 4x4 posts, also removed from the site were bottles, metal pipe, cans, sheet metal, and other garbage.

Contractor E.P.Johnson tried to remove a metal door but was unable to due to it's size and not having a machine. The door was left and will be removed at later date also left was a pile of concrete debris. Contractor finished up site and has moved down to site PSN 72/82 south of road L-SW and are removing 5-gallon buckets, cans, bottles, pieces of cable, wood, and other garbage that can be packed out by hand. An old trailer frame has been found and marked, the frame is approx 18 foot in length. Contractor does not have the equipment to remove the frame so it will be left until a plan can be devised to remove it. Claude from the Corps has also found a large number of bricks and a large pile of concrete debris, both of these were left until contractor can find an easier way to remove the debris instead of packing it out.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered/Corrective Actions:
Found an old trailer frame and contractor has no way of removing it due to it's location and specifications listed in the removal of debris.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward J

DAILY QA REPORT

Date: November 11,1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Bill Neylan (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
E.P.Johnson arrived today and returned to the PSN 72/82 Site, south of road L-SW. Contractor is removing tin cans, bottles, wood debris, communication wire, pieces of glass, and other garbage. The items that were picked up today had been marked earlier by the Corps. Contractor has finished removing debris at site and still needs to pick up the bricks and possibly the trailer frame.

The contractor has moved to the H-81R Site and removing glass, tin cans, communication wire, oil filters, wood, and other misc debris. Debris cleanup is going slow due to the distance the contractor has to walk to pack in the debris. Contractor is disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered / Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward J. Aragon

DAILY QA REPORT

Date: November 12,1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Bill Neylan (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
E.P.Johnson arrived today and were removing debris from site H-81R debris removed was paint cans, communication wire, metal pipes, bed frame, tin cans, bottles and other garbage. The contractor also has piled wood debris at two locations approx 100 yards apart and are located by the U.S.G.S. markers. The wood piles will be burned at a later date by the U.S. Fish and Wildlife Service. Contractor E.P.Johnson also found a small rifle pit which was disassembled and filled in with soil.

Contractor has moved down to site PSN 80 and is removing tin cans, cable, oil filters, metal pieces, insulators, bottles, and other misc garbage.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered / Corrective Actions:
Contractor also found two additional septic tank openings. The openings were marked with flagging and left.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward Aragon

DAILY QA REPORT

Date: November 15, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
E.P.Johnson arrived today and was removing debris from site H-83L. The contractor removed communication wire, tin cans, glass, barb wire, 2 sections of galvanized pipe, wood, and other misc garbage. Claude from the Corp found three additional septic tank openings which were surrounded by rebar. The contractor removed all of the rebar which was protruding from the openings. The contractor also found three bollards with approx one yard of concrete on the ends. The bollards were left because of their size and weight. Contractor also has found what appears to be a buried tank of some type, this object was also left. Contractor finished up today with the removal of debris from site and are disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered/Corrective Actions:
Three additional septic tank openings, a buried tank, and three bollards were found. All three of these items were to large to be removed by the contractor at this date.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: November 16, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
E.P.Johnson is now working at site PSN 90 removing sections of metal pipe, fence wire (barbed and mesh), glass, metal pieces, asbestos shingles, concrete pieces, rebar, and other misc garbage. The contractor has found an area in the northwest corner which has building materials that are partially buried. The contractor spent the remainder of the day picking up smaller debris and leaving the larger debris mainly the buried sheet metal and large sections of concrete. The contractor also did not remove the four cubic yards of contaminated soil. The contractor E.P.Johnson finished up the day and disposed of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered / Corrective Actions:
Contractor found building materials which were partially buried and also large sections of concrete. Both the building material and concrete were left at site.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: [signature]

DAILY QA REPORT

Date: November 17, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Kubota loader, dump truck and misc. hand tools.

Work Performed:
E.P.Johnson removed a metal door at site H-83C and also eight sheets of sheet metal with fiberglass insulation which was attached. The contractor also removed a concrete rubble pile. Debris removal is now complete at site H-83C.

Contractor E.P.Johnson moved down to site H-81R and removed the contaminated soil which was sampled by George Gardner from Shannon & Wilson. The soil was removed using the Kubota loader and was disposed of at the Richland Landfill. The contractor also removed a buried 55 gallon drum.

Field Analysis Performed:(Instrument Checks,Calibrations)
None.

Problems Encountered / Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: November 18, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Kubota loader, dump truck, and misc. hand tools.

Work Performed:
Contractor E.P.Johnson removed 5-55 gallon drums of contaminated soil from site PSN 80 and also they removed the two pallets the drums were placed on. Debris removal is now complete at site PSN 80.

The contractor moved to Bridge View site and picked up the 18 inch reinforced concrete pipe. Debris removal is now complete at Bridge View site.

The contractor has moved down to the Gravel Pit and is removing wire, cans, bottles, cable, concrete, and misc garbage. The contractor tried to use the Kubota loader to help in the removal of debris but ran into problems with wire and cable which continued to snag and cause the loader to lose its load. The contractor left site to dispose of debris at the Richland Landfill and will return with a load of pit run material to fill in cisterns.

Contractor returned with a load of pit run material and used it to fill in Cow Cistern, Clay Pit Cistern, and a small portion of the Wasteway Cistern. Before the cisterns were filled all debris was removed from the site. Contractor returned to the Gravel pit and finished up the day removing debris.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:
Disposal of 5 55-gallon drums of contaminated soil. Before drums were removed I asked Claude what the contaminated soil was and he informed me that it was oil contaminated and it would be alright to dispose of the soil in the landfill. The Contractor (E.P. Johnson) also informed Claude that they were unable to take drums to the landfill because the dump would not accept the drums. Claude called his office and informed them about the problems and they informed him to dump the soil from the drums into the back of the 6 CY dump truck. Claude took care of the drums by hauling them to the Pasco Sign Shop.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
<u>Level D.</u>

Prepared By:

DAILY QA REPORT

Date: November 19, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Kubota loader, dump truck, and misc. hand tools.

Work Performed:
Contractor E.P.Johnson returned to the Gravel Pit site and are removing cans, wire, bottles, pieces of metal and other garbage. The contractor is removing all the debris by hand. Contractor finished up loading the dump truck and are heading to the Richland Landfill and shall return with a load of pit run material to fill in the Wasteway Cistern.

The contractor returned with a load of pit run and unloaded it in the Wasteway Cistern. Contractor returned to the Gravel Pit site and again filled the six yard dump truck with debris. E.P.Johnson again made a trip to the Richland Landfill and also to get a second load of pit run material. Contractor dumped pit run material at the Wasteway Cistern.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered / Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: [signature]

DAILY QA REPORT

Date: November 22, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
Contractor E.P.Johnson are removing debris from site PSN 90. The debris being removed is misc wood, wire (barbed and mesh), metal pipe, concrete, wood pallets, sheet metal, paint cans, plastic, and other garbage. The contractor has made an effort to remove some of the partially buried building debris in the northwest corner. Contractor spent the entire day removing debris and finished the day disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered / Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: November 23, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
Contractor E.P.Johnson returned to site PSN 90 and again are removing wire, building material, wood, cans, oil filters, banding material, pieces of concrete, and other misc debris. The contractor finished loading the dump truck and went to dispose of the debris at the Richland Landfill and shall return with a load of pit run material. The contractor returned with a load of pit run material and dumped at the Wasteway Cistern. E.P.Johnson crew returned to site PSN 90 and finished up the day removing debris.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward J

Daily QA Report

Date: November 24, 1993

Project Name: Expedited Response Action, Phase I   Project Number: V-0201-01

Project Location: Hanford-North Slope

Sampling Personnel: George R. Gardner

Weather Conditions: 7 °F, wind 0 knots, clear

Observations/Comments: Personnel on site: Klint Johnson & Ron Adams (E.P. Johnson); Claude Huckins (Corps)

Work Performed:
7:45 AM E.P. Johnson started work at PSN 72/82 Site removing two railroad ties, numerous small pieces of lumber, and about 45 bricks. The bricks were brought out the 300 meters to the road in a wheelbarrow. The debris was loaded into a 6 CY dump truck.

11:00 AM E.P. Johnson personnel left site and took material to Richland Landfill, they proceeded to Central PreMix and picked up a load of pit-run gravel for backfill of the Wasteway Cistern.

11:15 AM Left PSN 72/82 Site after inspection and went to PSN 90. Conducted an inspection of this site, all building material and other debris removed with the exception of concrete rubble from the demolished grease rack, several concrete building pads, building material buried on the site, and the contaminated soil.

12:05 PM Arrived at PSN 01 started reconnaissance of site.

2:00 PM E.P. Johnson personnel arrived and started debris cleanup at sites marked by Shannon & Wilson and Corps personnel.

3:15 PM Departed site.

Quality Control Activities Conducted:
Conducted inspection of PSN 72/82 site, PSN 90 Site, and pre-work reconnaissance of PSN 01.

Levels of Personnel Protection Used During Field Work:
Level D.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: November 26, 1993

Project Name: Expedited Response Action, Phase I Project Number: V-0201-01

Project Location: Hanford-North Slope

Sampling Personnel: George R. Gardner

Weather Conditions: 4 °F, wind 0 knots, very foggy.

Observations/Comments: Personnel on site: Klint Johnson & Ken Linck (E.P. Johnson); Claude Huckins (Corps)

Work Performed:
7:45 AM E.P. Johnson started work at PSN 01 Site removing numerous small pieces of lumber and cable. The debris was loaded into a 6 CY dump truck.

10:00 AM E.P. Johnson personnel left site and took material to Richland Landfill, they proceeded to Central PreMix and to pick up a load of pit-run gravel for backfill of the Wasteway Cistern.

10:00 to 11:30 AM Conducted a more complete reconnaissance of site. Found a perimeter road along which a single strand barbed wire fence had been constructed. The wire was attached to 5 foot screw pickets. The fence was about a mile long and circled the PSN 01 site from about 3:00 o'clock counterclockwise to 8:00 o'clock. We also found numerous 1"x 6" boards embedded in the ground to contain the gravel used on the site for walkways. Numerous sections of 1" steel cable were also found.

1:00 PM E.P. Johnson personnel arrived and stated that they had not been able to get into the Richland Landfill and that Central PreMix had been closed. They had gone to the Pasco Landfill. They started debris cleanup, picked up sections of cable, barbed wire and wood debris.

2:50 PM Departed site.

Quality Control Activities Conducted:
Conducted inspection of PSN 01.

Levels of Personnel Protection Used During Field Work:
Level D.

George R. Gardner
Senior Environmental Engineer

DAILY QA REPORT

Date: November 29, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
Contractor E.P.Johnson is removing debris from site PSN 01. The contractor spent the majority of the morning rolling up approximately one mile of barbed wire surrounding the site. The contractor also spent a great deal of time removing wood debris. Debris removed today was barbed wire, wood, glass, cable, 2 sections of six inch concrete pipe, tin cans and other misc debris. The contractor finished up the day by disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: November 30, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc hand tools.

Work Performed:
Contractor E.P.Johnson returned to site PSN 01 and are removing barbed wire, wood, cable, timbers, bottles and other garbage. Contractor finished up with debris at site and went to dispose of debris at the Richland Landfill and shall return with a load of pit run. Contractor has returned with a load of pit run material and dumped it at the Wasteway Cistern. Contractor E.P.Johnson returned to PSN 01 and finished removing the last of the debris. Debris removal is now complete at site PSN 01.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward [signature]

DAILY QA REPORT

Date: December 1, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
Contractor E.P.Johnson is at Igloo Site removing barbed wire, wood, metal pieces, tin cans, cable, and other garbage. Contractor spent the majority of the morning looking for debris and packing it back to the truck. Contractor finished removing debris at this site and is disposing of debris at the Richland Landfill and shall return with a load of pit run material. Contractor has returned with a load of pit run material and dumped it at the Wasteway Cistern.

Contractor then moved down to site PSN 04 and removed wood, wire, tin cans, 4 pole stabilizer rods, glass and other garbage. The contractor finished the day by disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: December 2, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
Contractor E.P.Johnson returned to site PSN 04 and are removing barbed wire, tin cans, wood, banding material, and other garbage. The contractor has left for the Richland Landfill and shall return with a load of pit run material. The contractor returned and informed Claude and myself that the truck has had a tire blowout and they will be down until a tire repair man can replace tire. The contractor brought out a load of pit run material and dumped it at the Wasteway Cistern after tire was replaced. Wasteway Cistern is complete.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:
Contractor had a tire blow out.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: Edward Aragon

DAILY QA REPORT

Date: December 3, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
Contractor E.P.Johnson returned to site PSN 04 and removed wire, approx 200 feet of cable, wood, tin cans, drums, and other misc garbage. Contractor was loaded early this morning and was informed by Claude that instead of returning to site after dumping material at the Richland Landfill, contractor needs to go to the Rifle Range site.

E.P.Johnson disposed of debris at the landfill and went to the Rifle Range and removed 55-gallon drums that had been used for target practice and also some 5-gallon drums. The contractor did not spend a lot of time at the site and just picked up the larger items which had been marked. The contractor returned to site PSN 04 and removed additional debris and finished up the day by disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: [signature]

DAILY QA REPORT

Date: December 17, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Ken Linck, Ron Adams (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
12:30 to 1:45 Traveled to PSN 07/10, Contractor E.P.Johnson removed wire (barbed), wood (railroad ties), small wood debris, and other misc garbage. Contractor had already removed two loads of debris earlier this morning.

Walked around site with Claude and marked several piles of barbed wire and a 1/2 mile long section of fence that was laying on the ground.

E.P.Johnson personnel rolled up the wire and loaded wood into the 6 CY dump truck. Contractor finished up the day by disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By: [signature]

DAILY QA REPORT

Date: December 20, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
7:30 to 9:00 Contractor E.P.Johnson worked at PSN 07/10 Site removing wire (barbed), wood (railroad ties), small wood debris, and other misc garbage. Contractor removed four large bundles of wire and numerous timbers.

9:00 to 10:00 Contractor disposed of debris at the Richland Landfill.

11:30 to 12:00 Contractor picked up load of pit-run material at Central PreMix and traveled to Wagon Wheel Cistern.

1:30 to 1:45 Contractor dumped material into Wagon Wheel Cistern.

2:00 to 3:15 E.P.Johnson personnel returned to PSN 07/10 Site and loaded wire and placed wood on top of it in the 6 CY dump truck. Contractor finished up the day by disposing of debris at the Richland Landfill.

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Level D.

Prepared By:

DAILY QA REPORT

Date: December 21, 1993

Project Name: Expedited Response Action, Phase 1 Project Number V-0201-01

Project Location: Hanford - North Slope

Site Observer: Edward J. Aragon

Weather Conditions: Clear

Site Personnel: Claude Huckins (Corps); Klint Johnson, Ken Linck (E.P.Johnson).

Equipment: Six yard dump truck and misc. hand tools.

Work Performed:
7:30 to 9:45 Contractor E.P.Johnson worked at PSN 07/10 Site removing wire (barbed), wood (railroad ties), small wood debris, and other misc garbage. Contractor removed four large bundles of wire and numerous timbers by hand to the road.

9:45 to 11:50 Contractor disposed of debris at the Richland Landfill.

11:50 to 12:20 Contractor picked up load of pit-run material at Central PreMix and traveled to Wagon Wheel Cistern.

1:15 to 1:35 Contractor dumped material into Wagon Wheel Cistern.

1:50 to 3:00 E.P.Johnson personnel returned to PSN 07/10 Site and loaded wire and placed wood on top of it in the 6 CY dump truck. Contractor finished up the day by disposing of debris at the Richland Landfill.

NOTE: Slurry backfill at the following sites was completed:

PSN 80	16 CY
PSN 72/82	33 CY
H-06-L	29 CY

Field Analysis Performed:(Instrument Checks, Calibrations)
None.

Problems Encountered/Corrective Actions:

Quality Control Activities Conducted:

APPENDIX C

PHOTOS

Photo 1. Bridge View Site. Wire mesh, barbed wire, rebar, miscellaneous building materials and two wood piles to be burned by U.S. Fish and Wildlife Service.

Photo 2. Bridge View Site. After debris cleanup.

Photo 3. Bridge View Site. Stove pipe and miscellaneous connections.

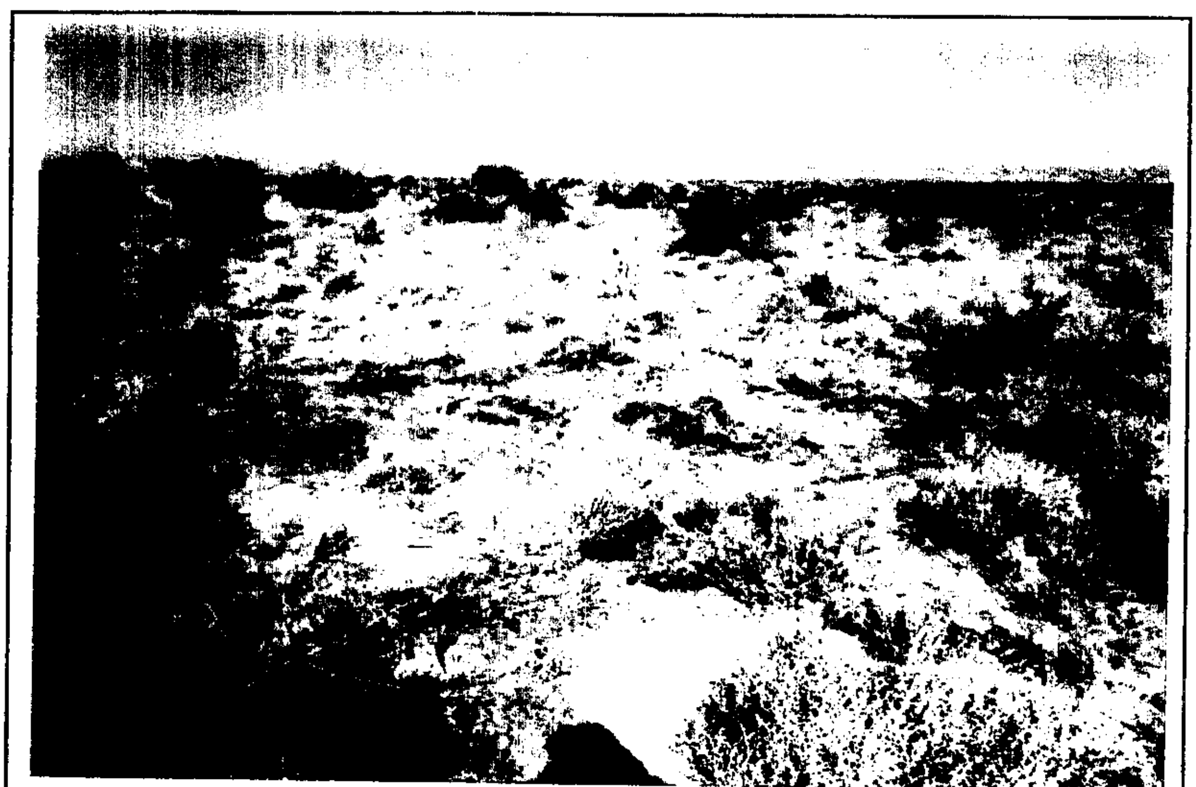


Photo 4. Bridge View Site. Site after stove pipes were removed.

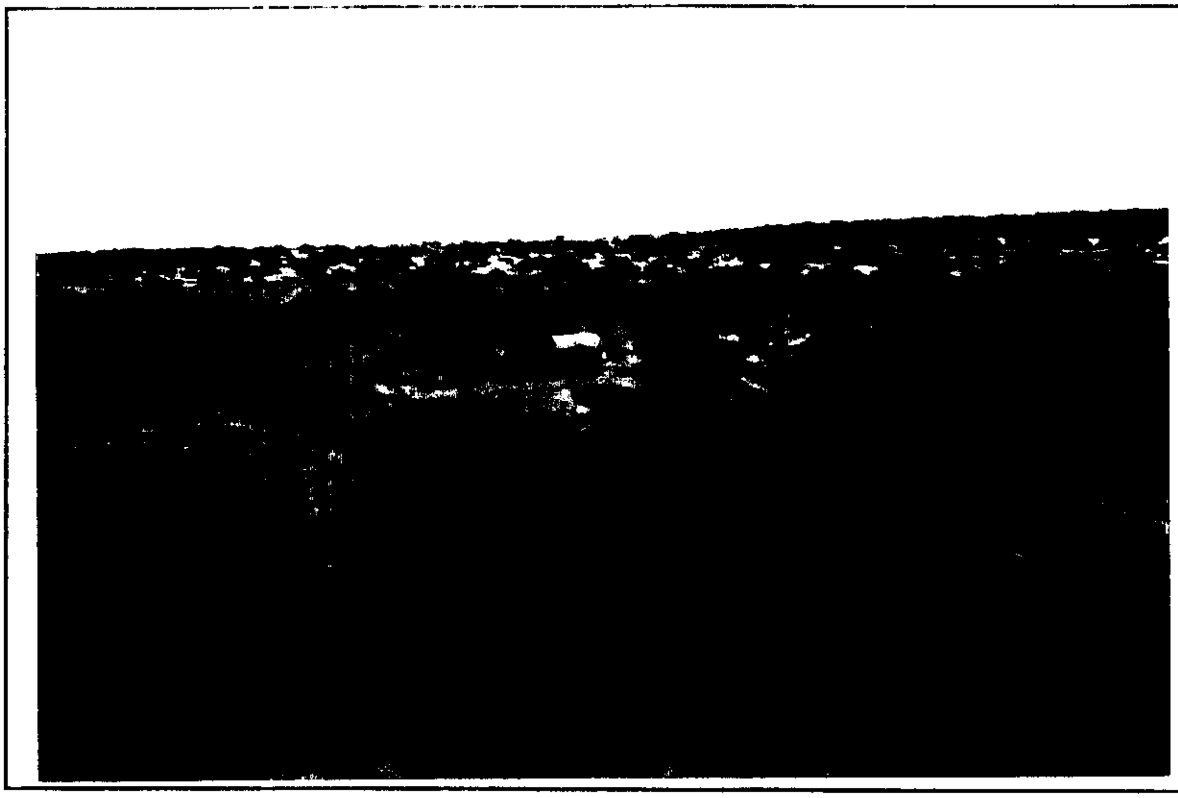


Photo 5. Bridge View Site. 18" RCP and miscellaneous wire, tin, and wire mesh.

Photo 6. Bridge View Site. After debris cleanup.

Photo 7. PSN 72/82 Site Miscellaneous 5-gallon buckets and tin cans.

Photo 8 PSN 72/82 Site. Cable, wire, tire, and cans found on the site

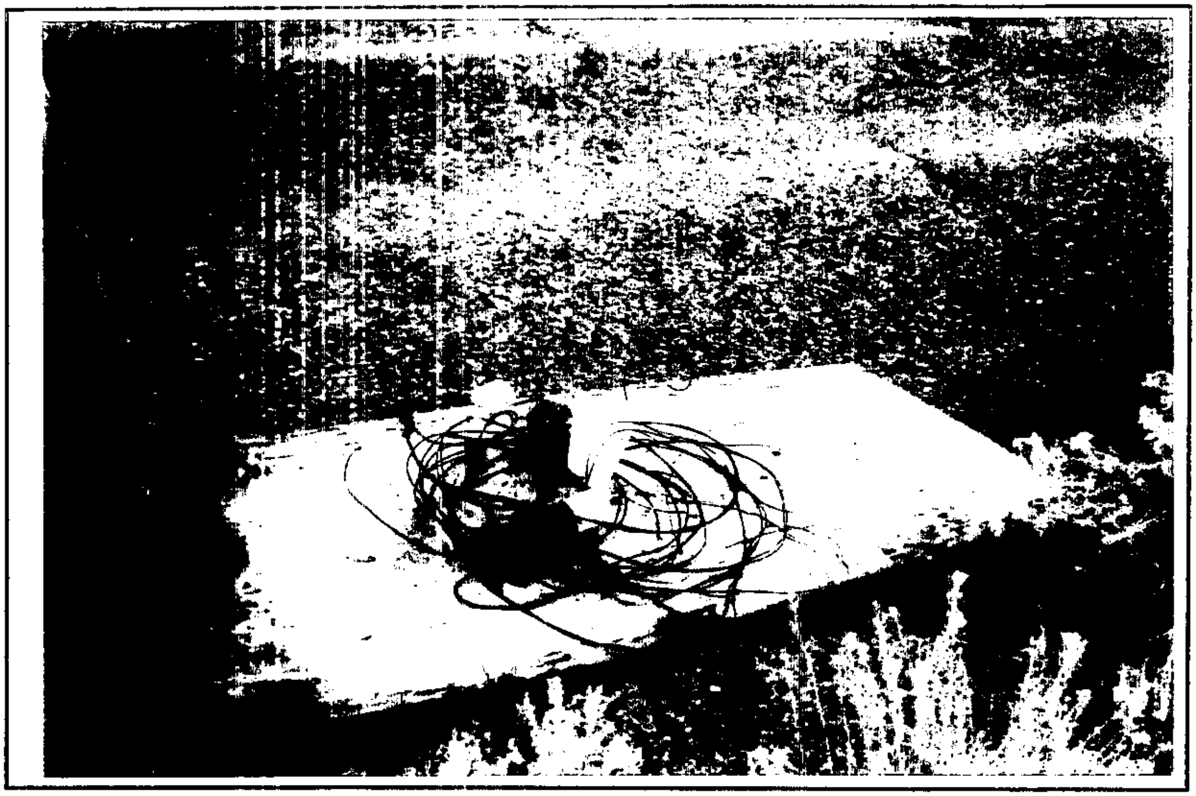


Photo 9. PSN 72/82 Site. Communications wire, tin cans, and miscellaneous garbage.

Photo 10. PSN 72/82 Site. Bricks found across road.

Photo 11. PSN 72/82 Site. 15-gallon drum resting in a rifle pit.

Photo 12. PSN 72/82 Site. 15-gallon drum after it was removed from rifle pit.

Photo 13. PSN 72/82 Site Miscellaneous garbage near access gate.

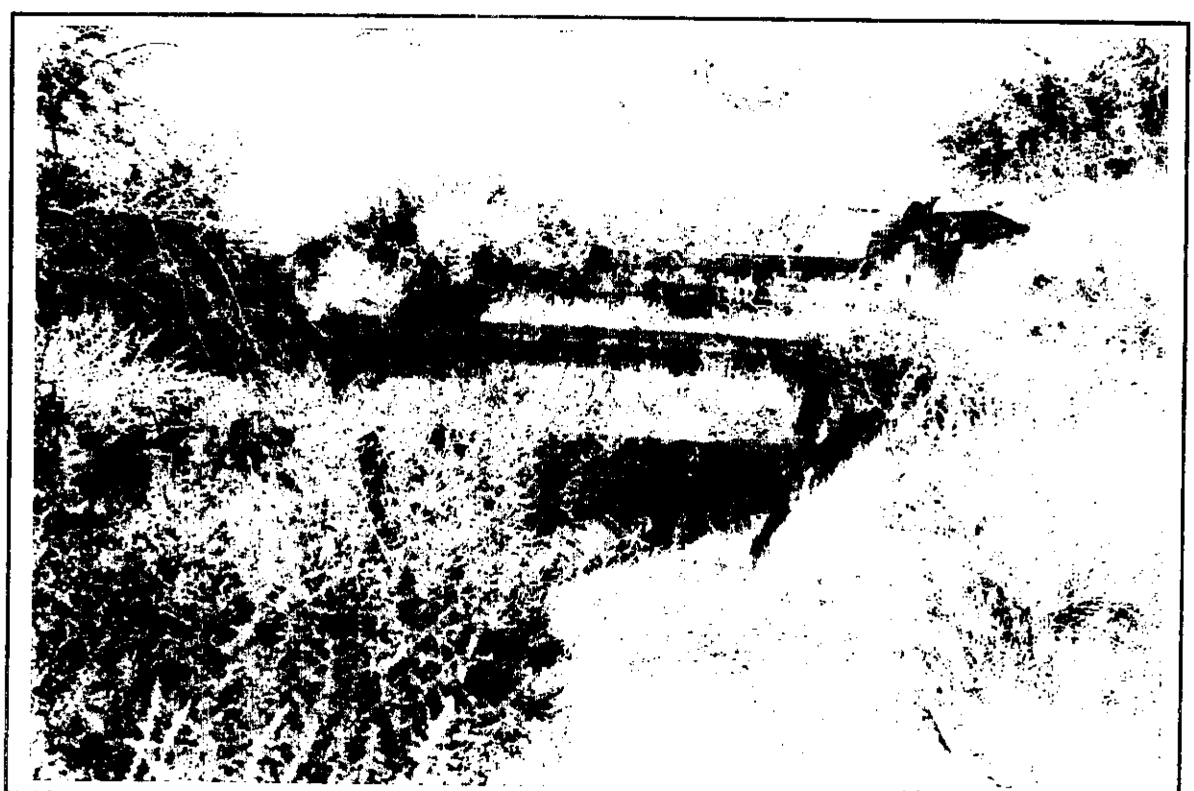


Photo 14. PSN 72/82 Site. Trailer frame which was not removed from the site.

Photo 15. H-83C Site. Well structure before excavation.

Photo 16. H-83C Site. Well structure after excavation and construction of access road.

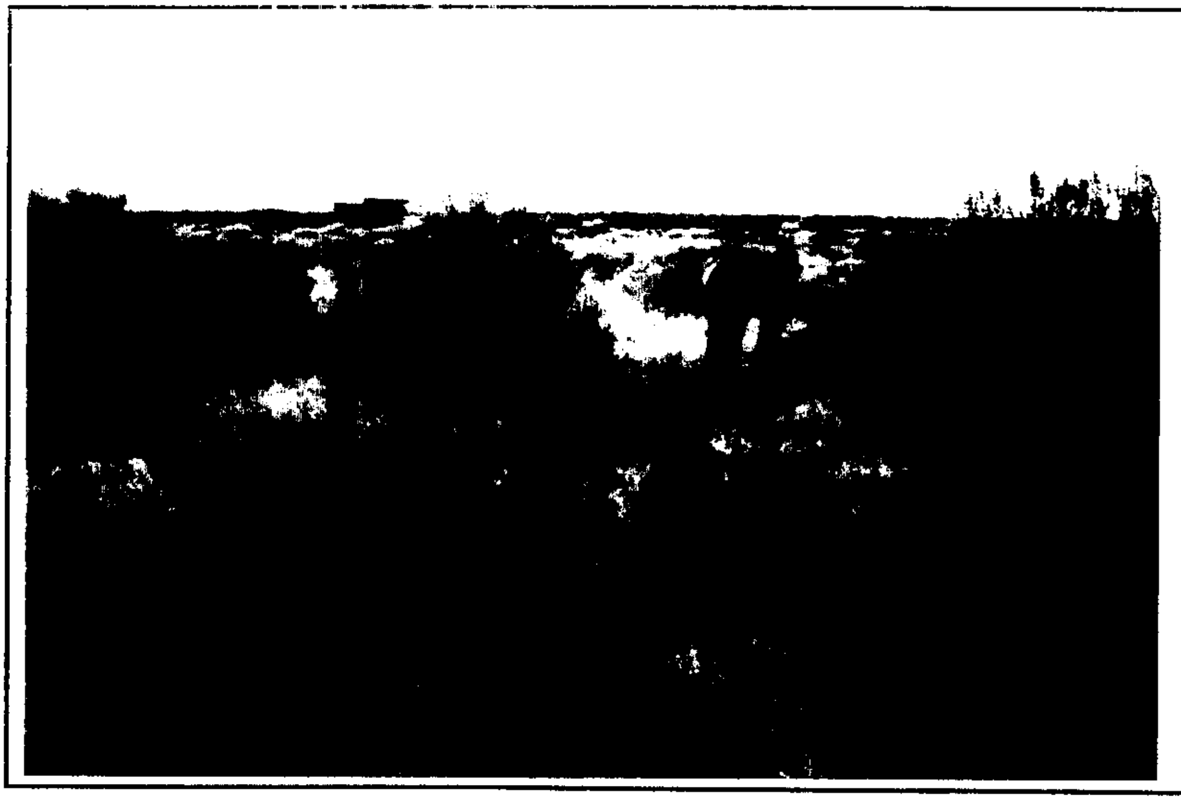


Photo 17. H-83C Site. Tires found at the site.

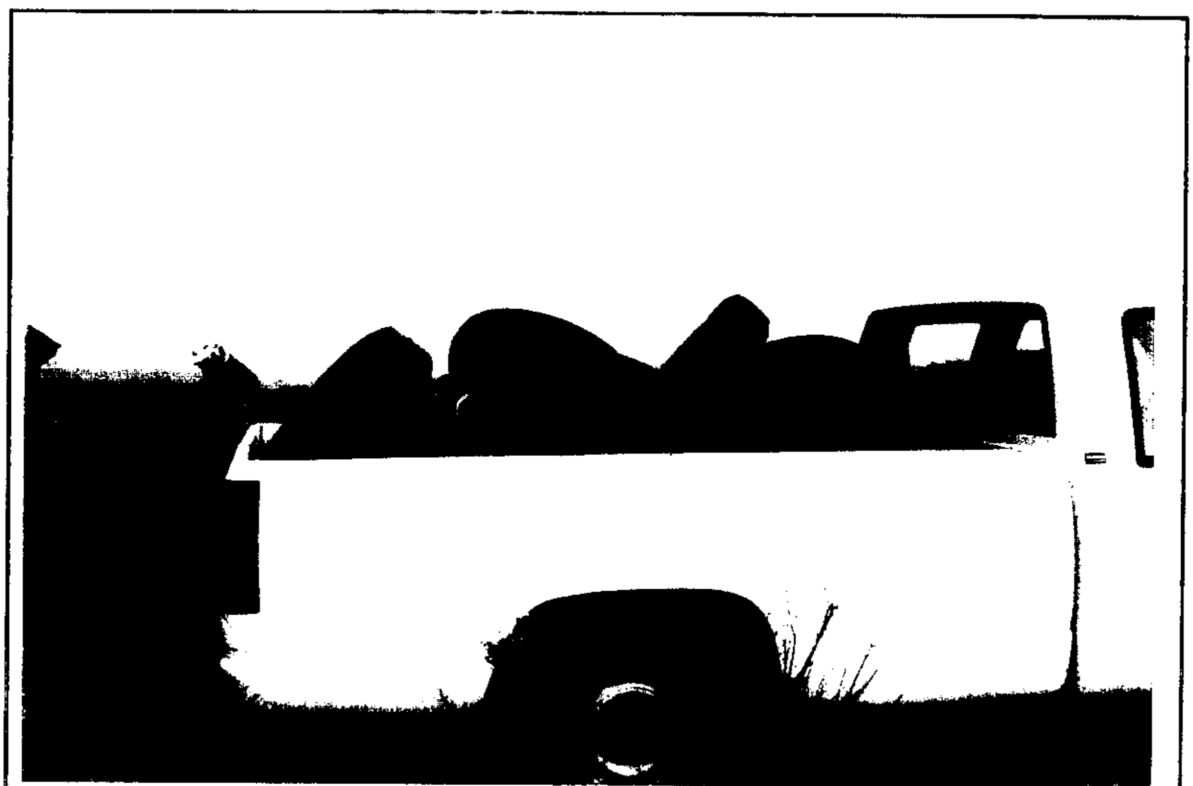


Photo 18. H-83C Site. Tires removed from the site.

Photo 19. H-83C Site. Additional septic tank found on site.

Photo 20. H-83C Site. Rebar found and cut off 6" below ground surface.

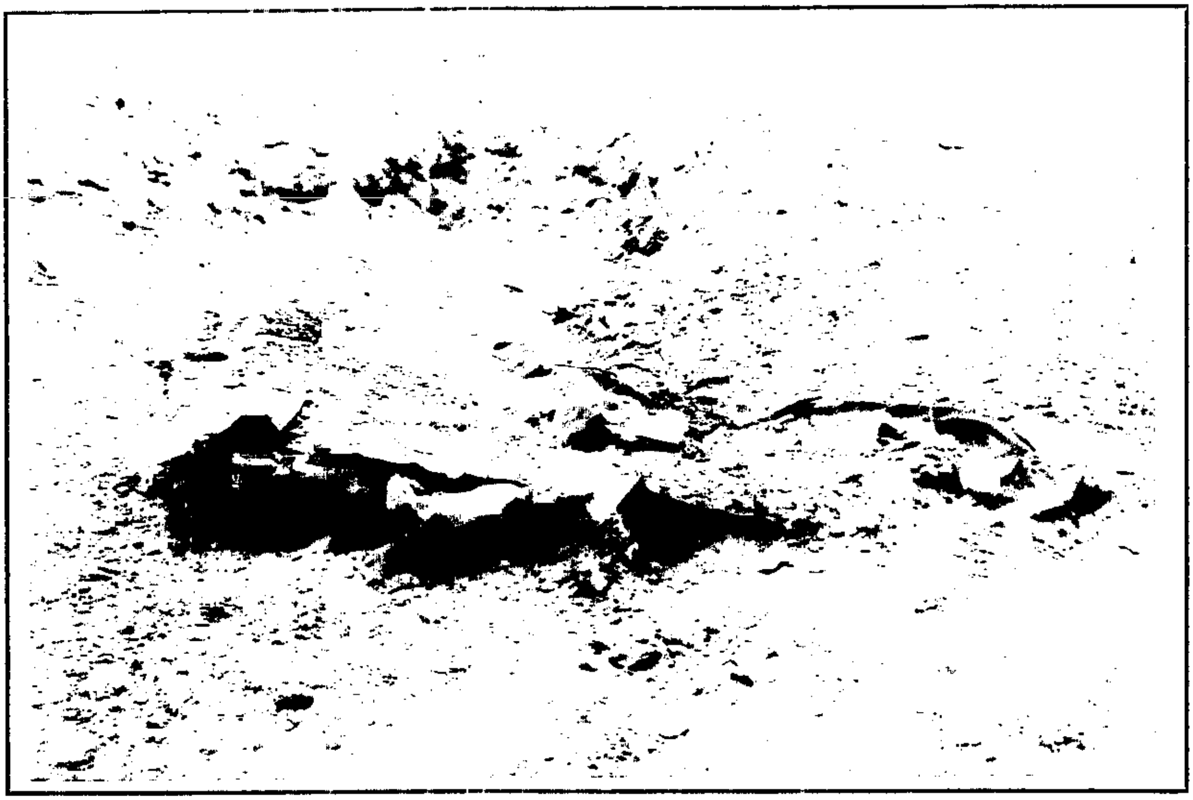


Photo 21. H-83C Site. Door frame found.

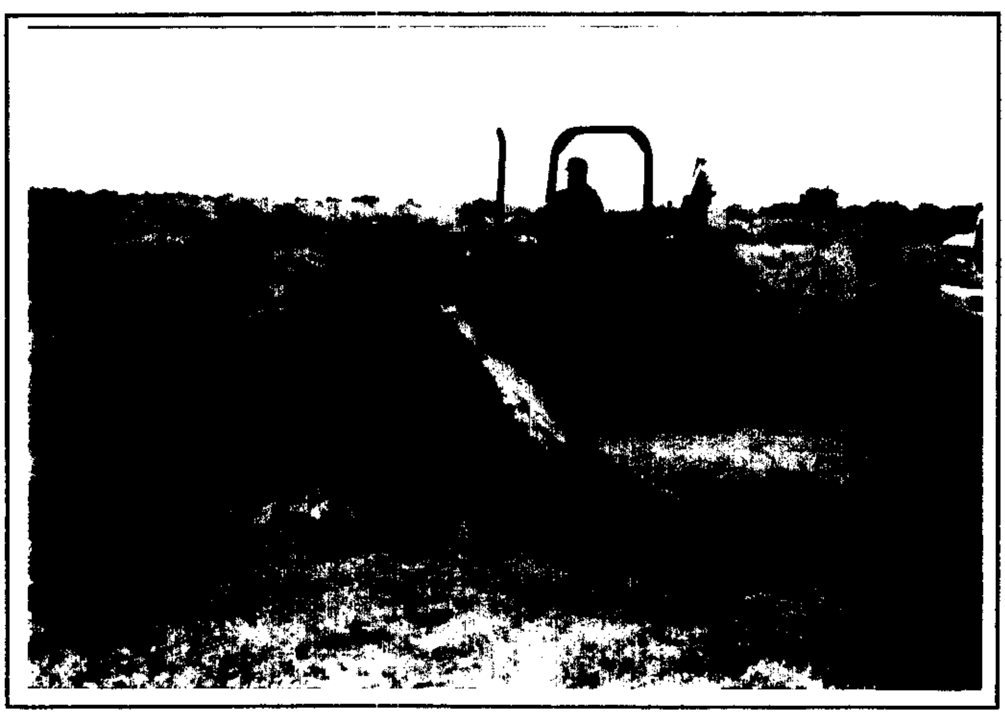


Photo 22. H-83C Site. Door frame dug out.

Photo 23. H-83C Site. Eight (8) wall sections removed with door.

Photo 24. H-83C Site. Concrete debris removed.

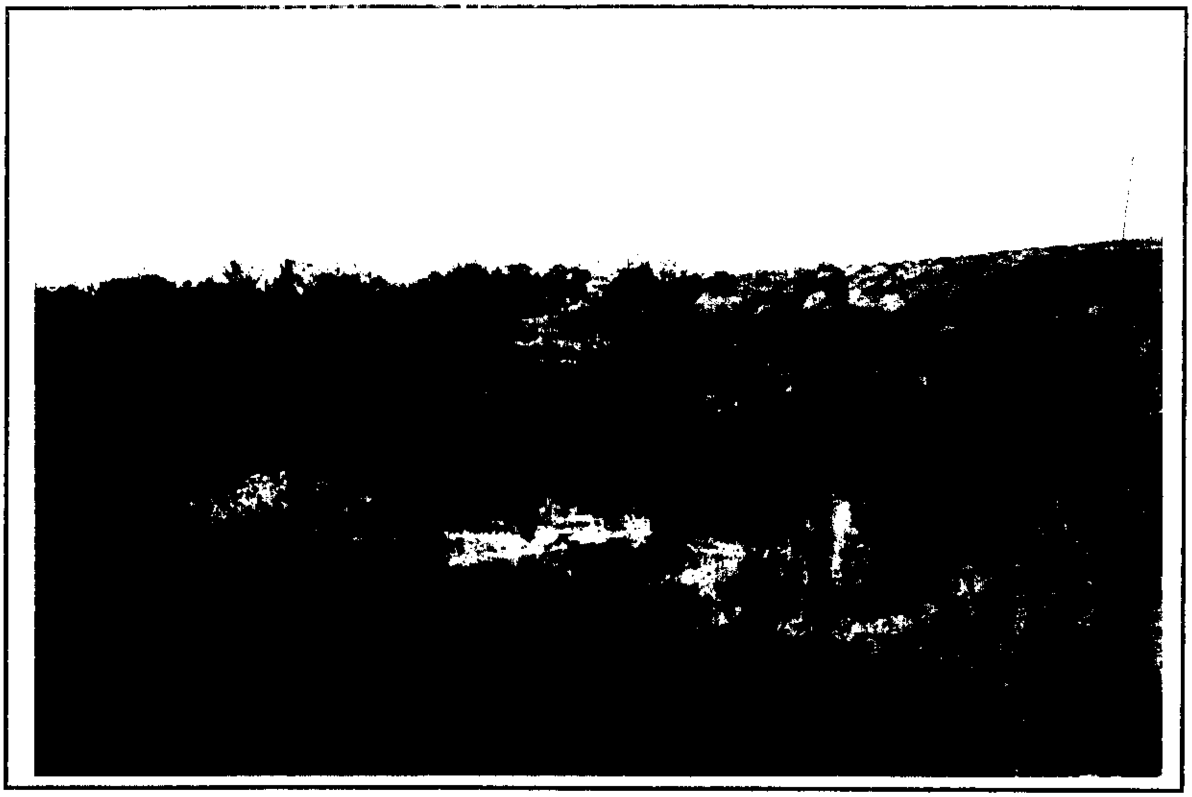


Photo 25. H-81R Site. Miscellaneous building materials.

Photo 26. H-81R Site. Tin cans and cable found on the site.

Photo 27. H-81R Site. Building materials that would be stacked.

Photo 28. H-81R Site. Stacked building materials to be burned later by the U.S. Fish and Wildlife Service.

Photo 29. H-81R Site. Collection of 1- and 5-gallon cans and banding material.

Photo 30. H-81R Site. 5-foot length of 6" RCP.

Photo 31. H-81R Site. Location of soil sampling.

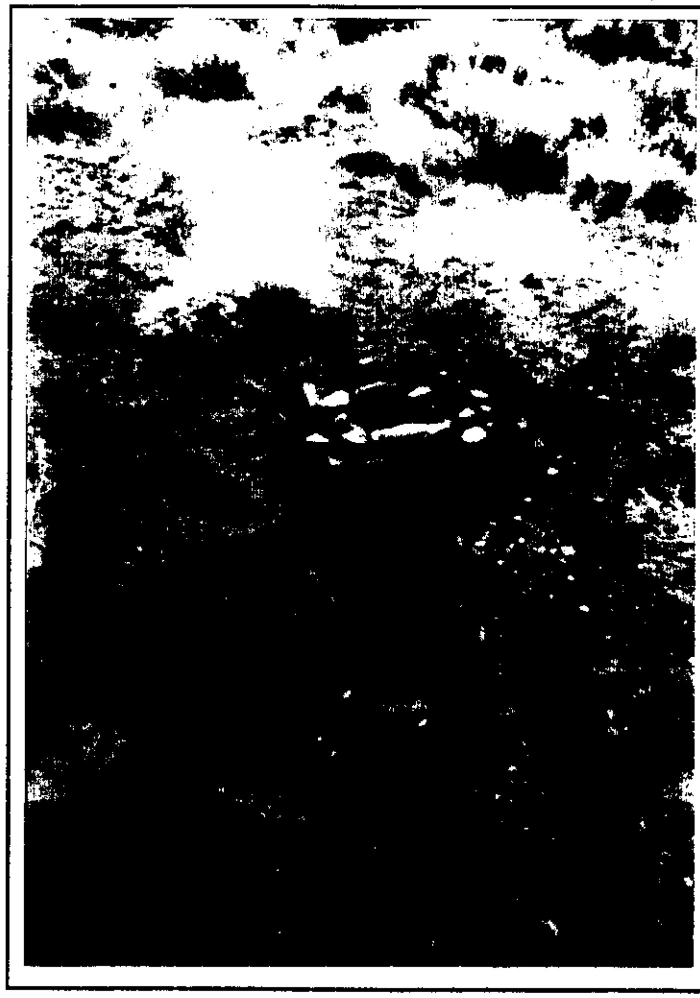


Photo 32. H-81R Site. Buried 55-gallon drum.

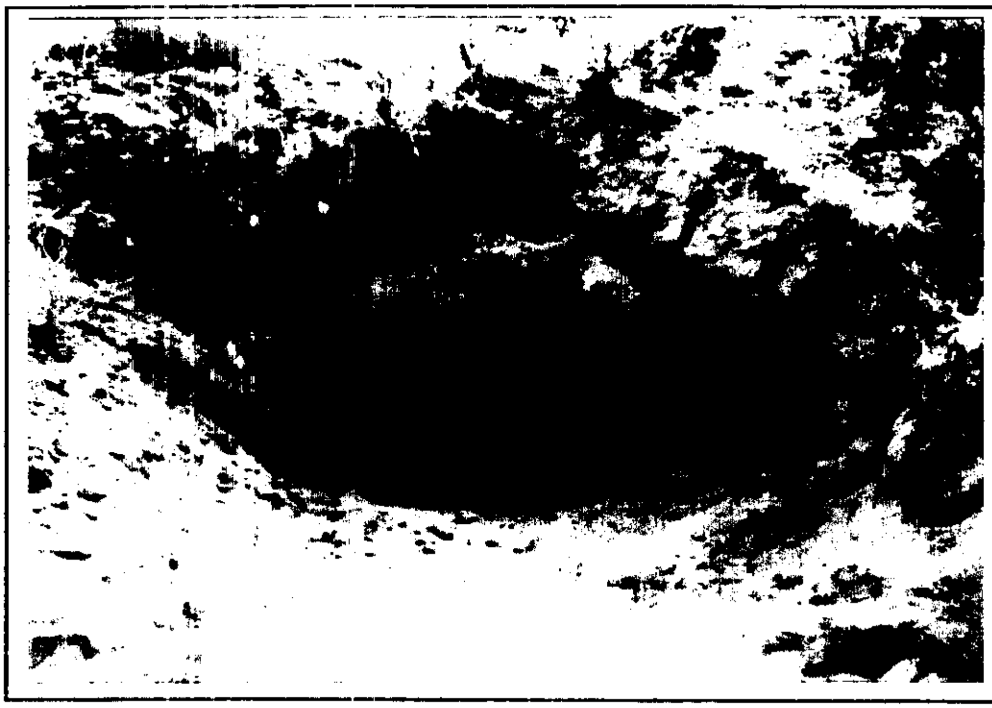


Photo 33. H-83L Site. Opening with rebar.

Photo 34. H-83L Site. Additional opening with rebar.

Photo 35. H-83L Site. Septic tank openings.

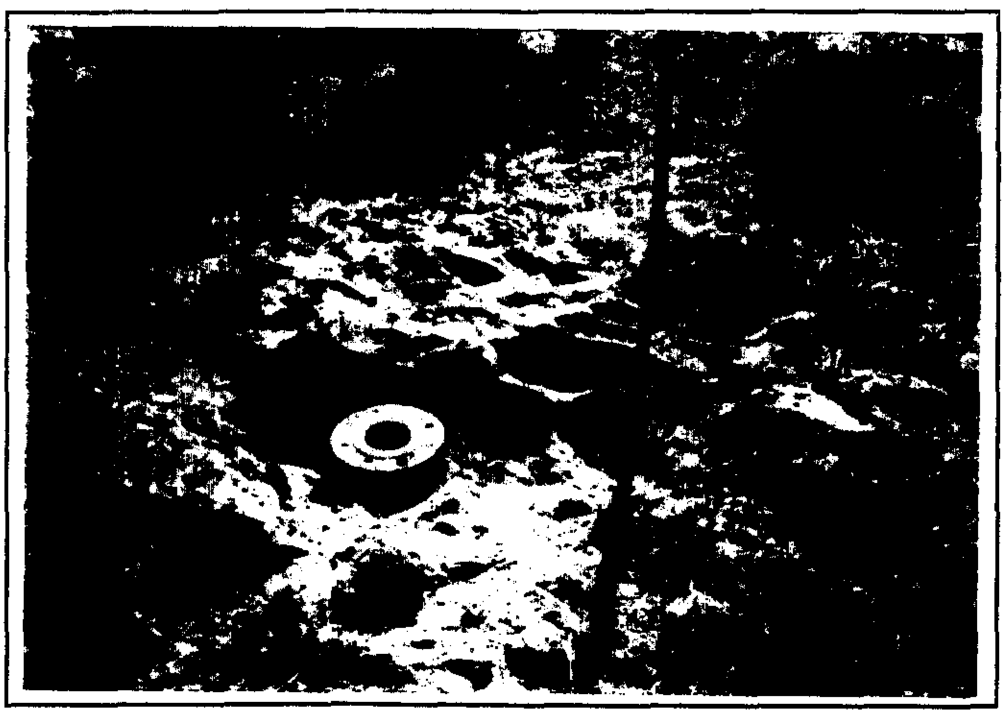


Photo 36. H-83L Site. Steel flange pipe, possible buried tank.

Photo 37 PSN 80 Site. Well structure before excavation.

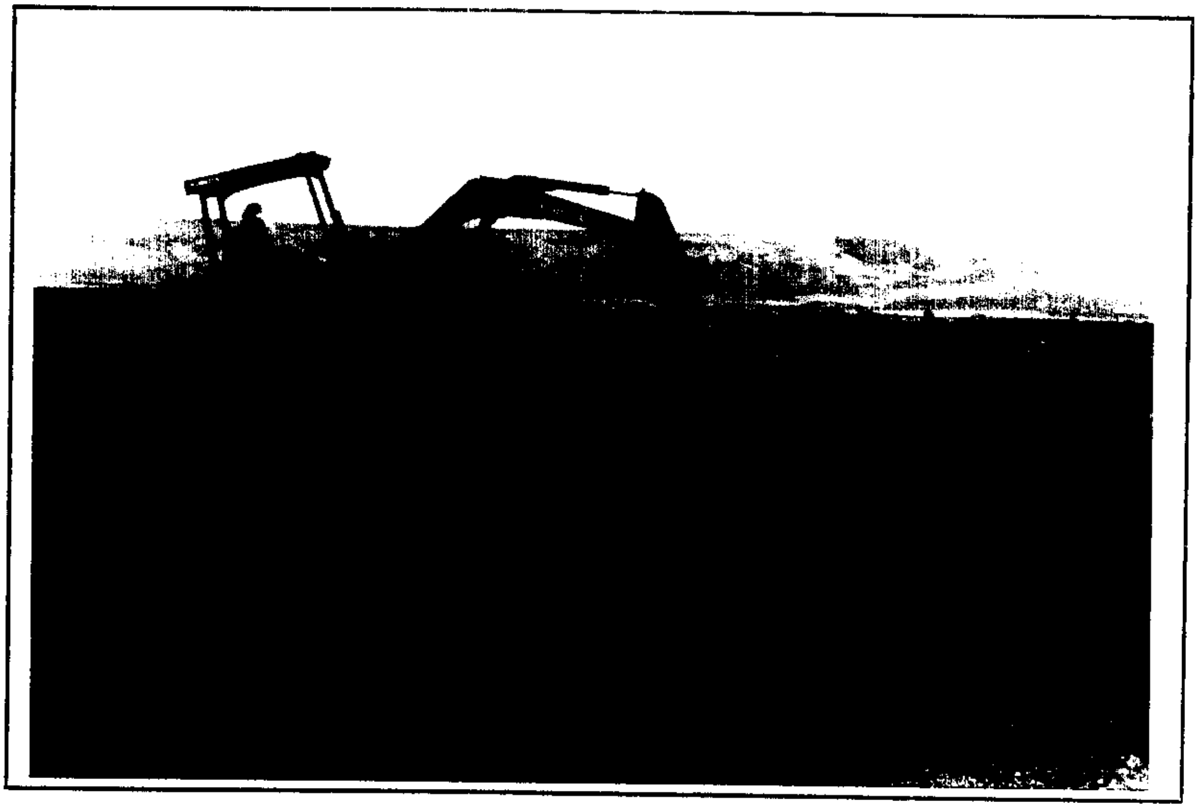


Photo 38. PSN 80 Site. Well structure being excavated.

Photo 39. PSN 80 Site. Well structure being excavated. Shows area of contaminated soil being separated.

Photo 40. PSN 80 Site Contaminated soil

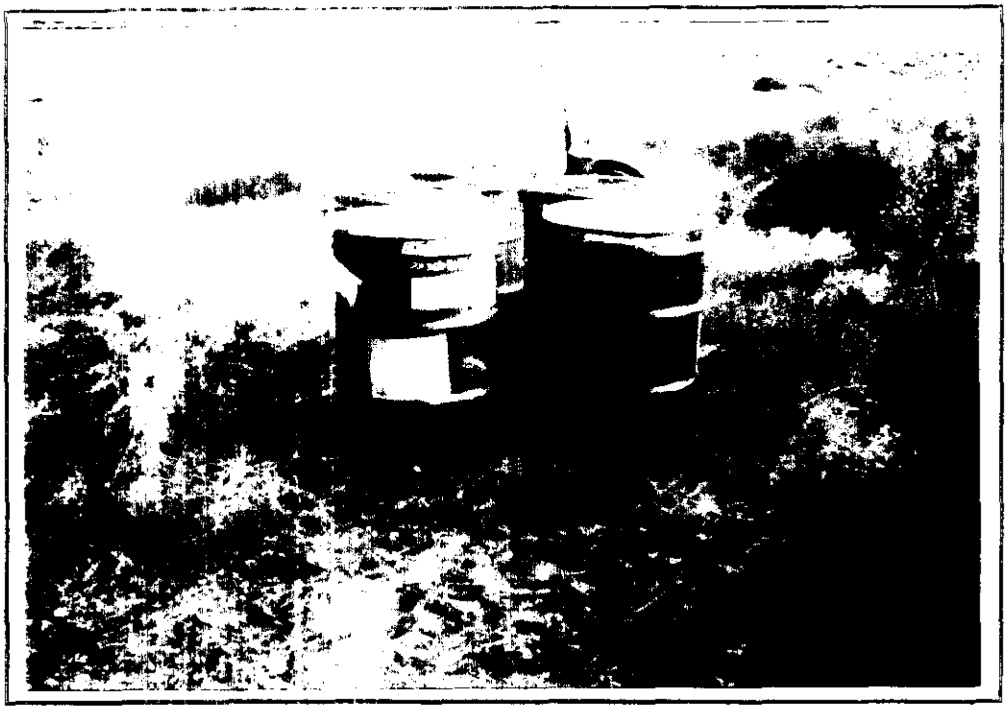


Photo 41. PSN 80 Site. Drums filled with contaminated soil.

Photo 42. PSN 80 Site. Additional septic tank found.

Photo 43. WSDOT Gravel Pit, No. 47 Part of debris on site.

Photo 44. WSDOT Gravel Pit, No. 47. Debris being removed.

Photo 45. PSN 90 Site. Banding material.

Photo 46. PSN 90 Site. Rock walls.

Photo 47. PSN 90 Site. Rebar and asbestos shingles on concrete pad.

Photo 48. PSN 90 Site. Partially buried building material.

Photo 49. PSN 90 Site. Buried building material.

Photo 50. PSN 90 Site. Pallets and pipe were removed.

Photo 51. PSN 01 Site. Tar debris.

Photo 52. PSN 01 Site. Communications wire, barbed wire, screw pickets, wood, and tin can.

Photo 53. PSN 01 Site. Wood debris.

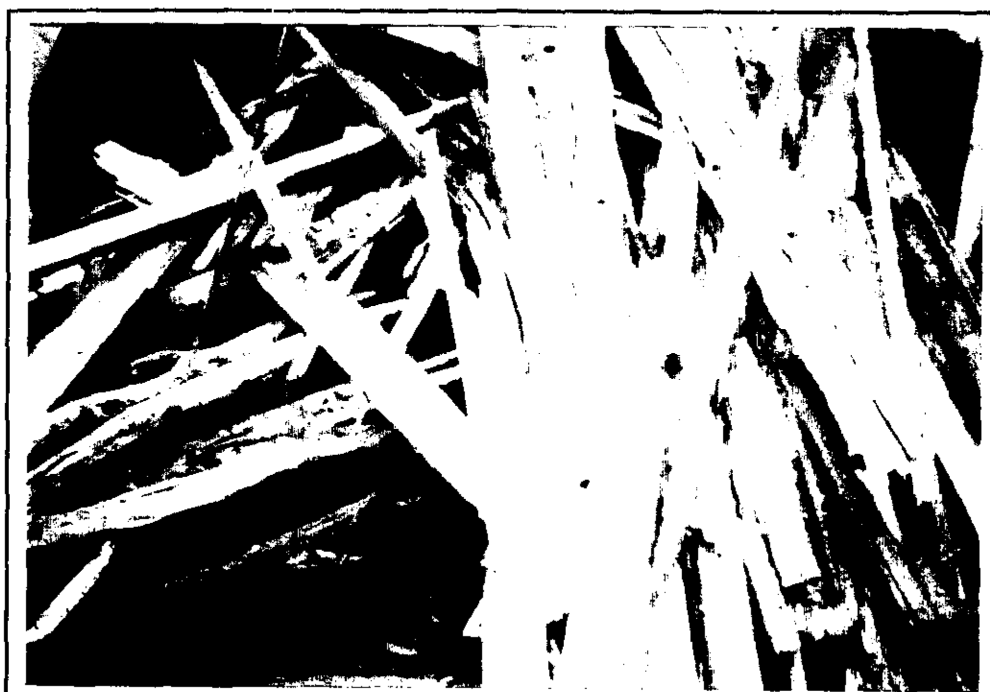


Photo 54. PSN 01 Site. Wood debris loaded in dump truck.

Photo 55. Cow Cistern Site. Before cleanup.

Photo 56. Cow Cistern Site. After cleanup.

Photo 57. Clay Pit Cistern Site. Before cleanup

Photo 58.
Clay Pit Cistern Site. After cleanup and filling with pit-run gravel.

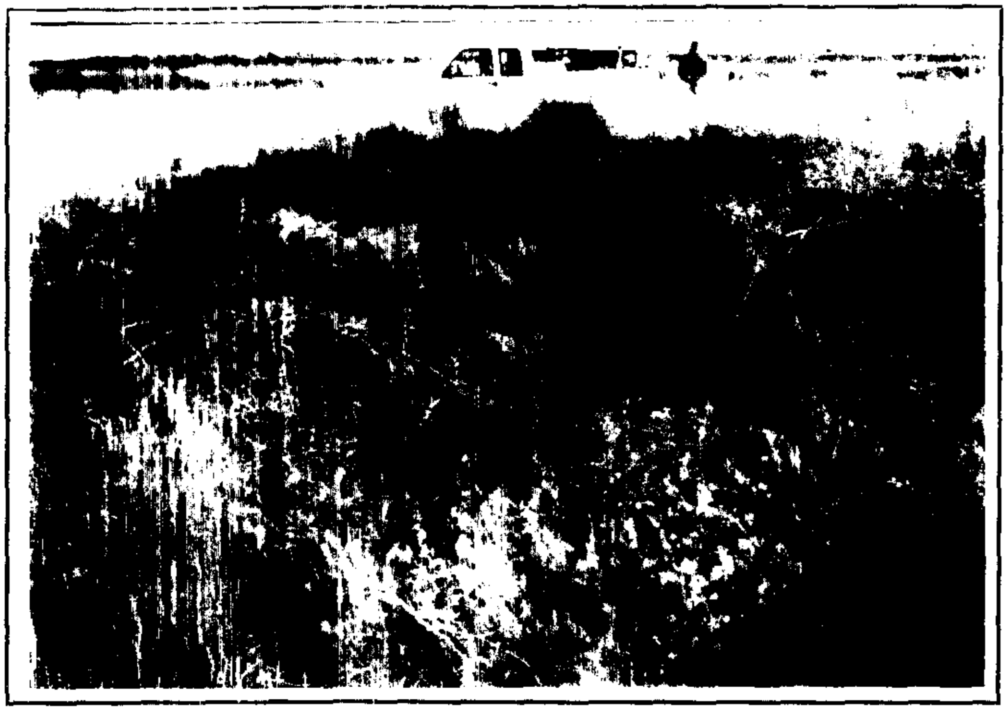


Photo 59. Wasteway Cistern Site. Cistern before being backfilled.

Photo 60. PSN 04 Site. Well structure being excavated.

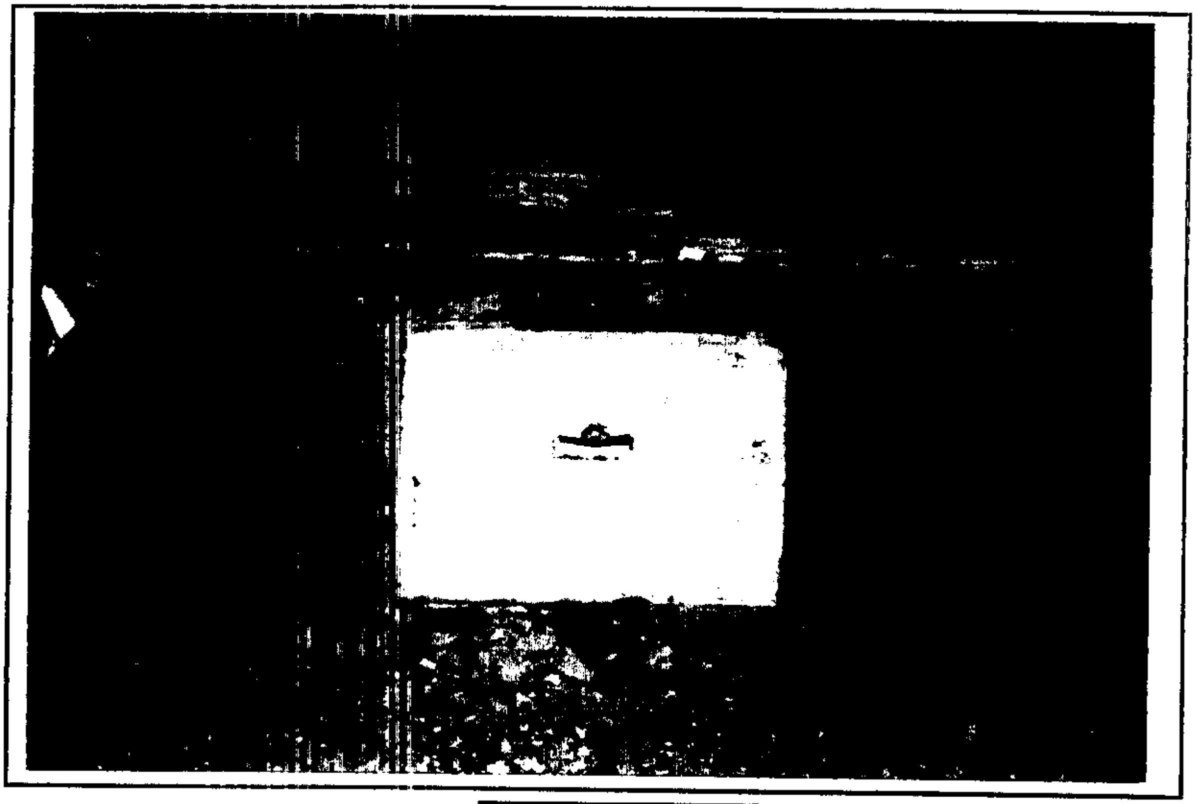


Photo 61. PSN 04 Site. Well structure completely excavated.

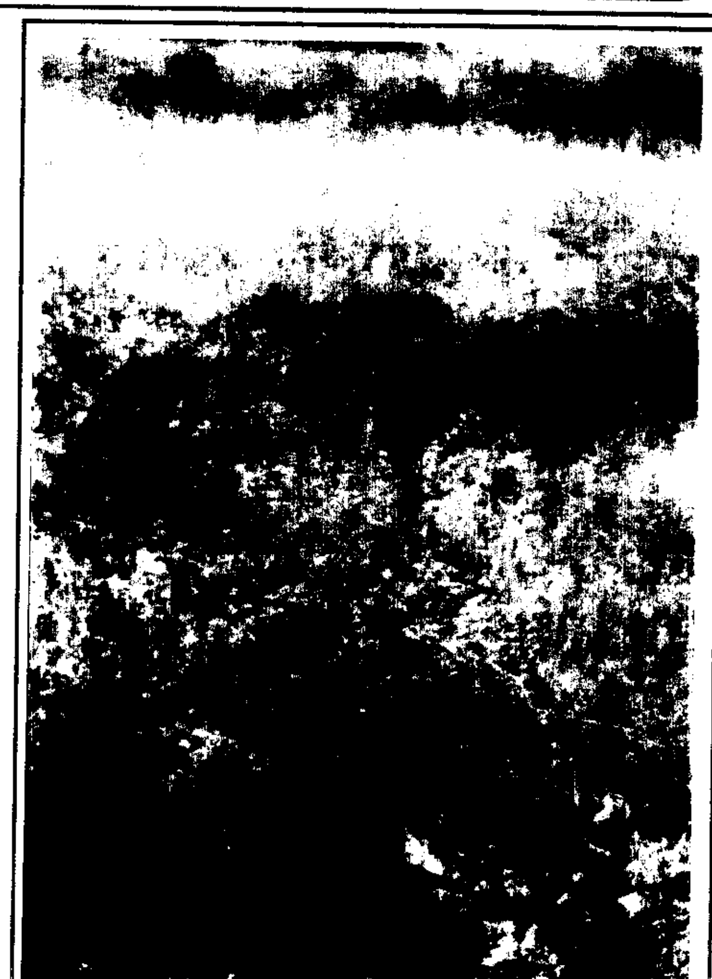


Photo 62. PSN 04 Site. Banding material on site.

Photo 63. PSN 04 Site Entrance to Bunker.

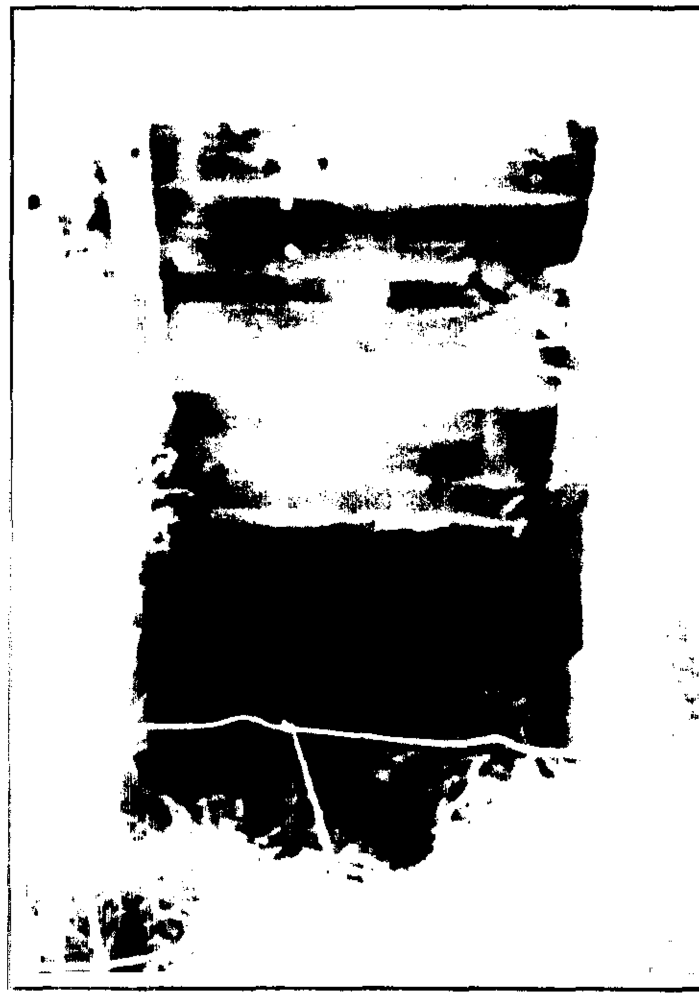


Photo 64.
PSN 04 Site. Entrance and exit to Bunker.

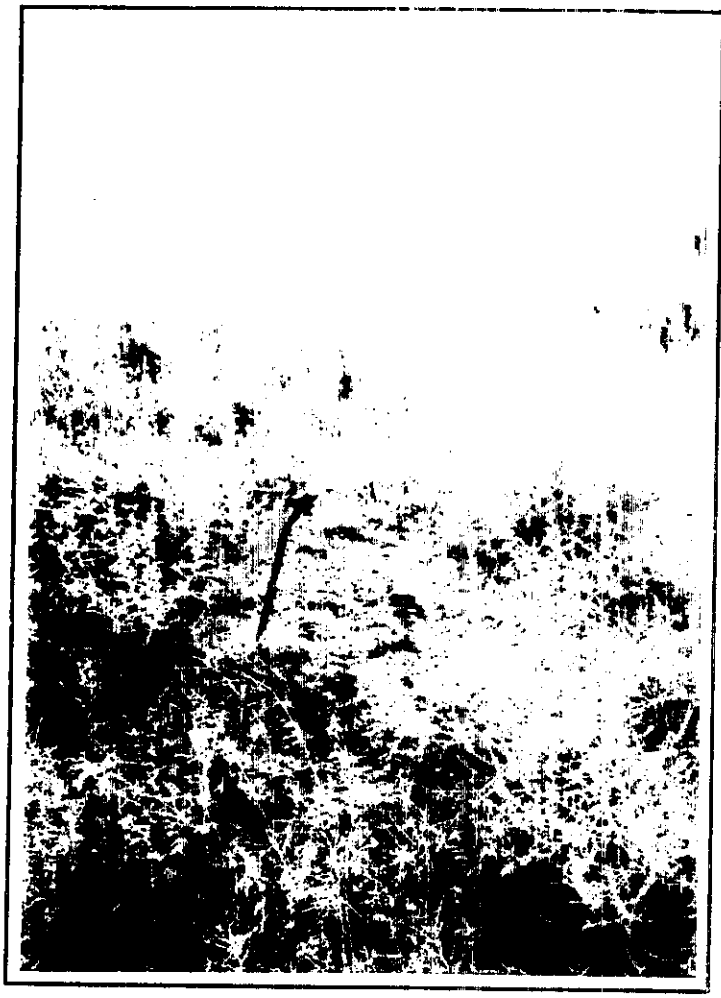


Photo 65. PSN 07/10 Site. Buried guy wire.

Photo 66. PSN 07/10 Site. Buried building material removed from site.

Photo 67. PSN 07/10 Site. Railroad ties removed from site.

Photo 68. PSN 07/10 Site. Barbed wire marked on site.

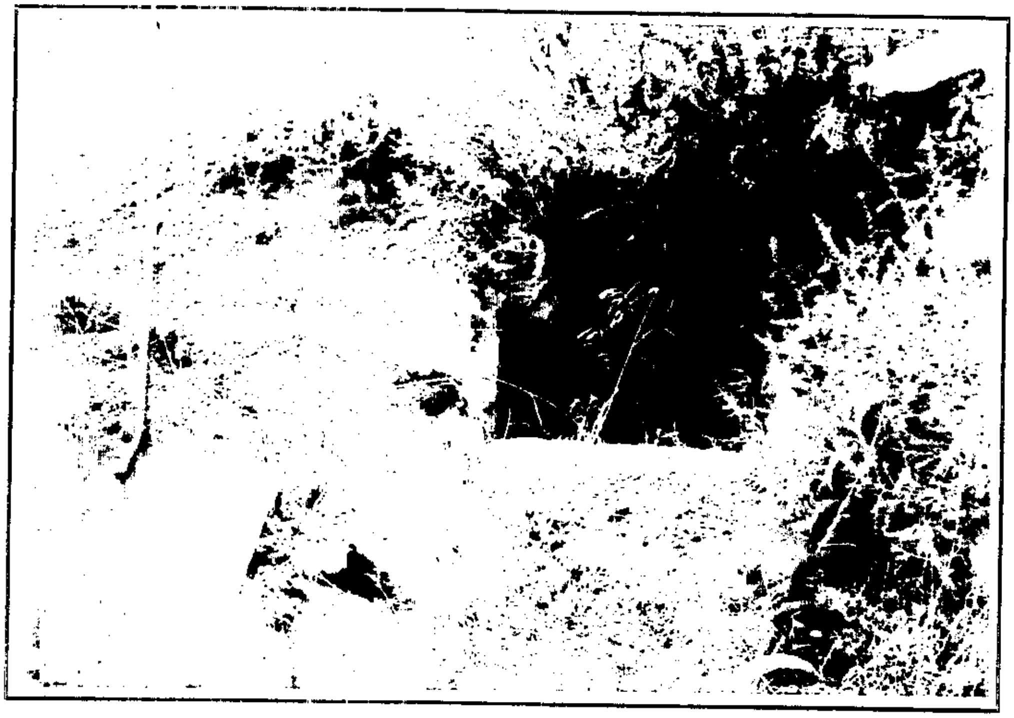


Photo 69. PSN 07/10 Site. Concrete sump and metal debris.

Photo 70. PSN 07/10 Site. Miscellaneous construction material.

Photo 71. Wagon Wheel Cistern.

Photo 72. Wagon Wheel Cistern.

Photo 73. Hanford Firing Range Point and Target Area Site. Metal Debris.

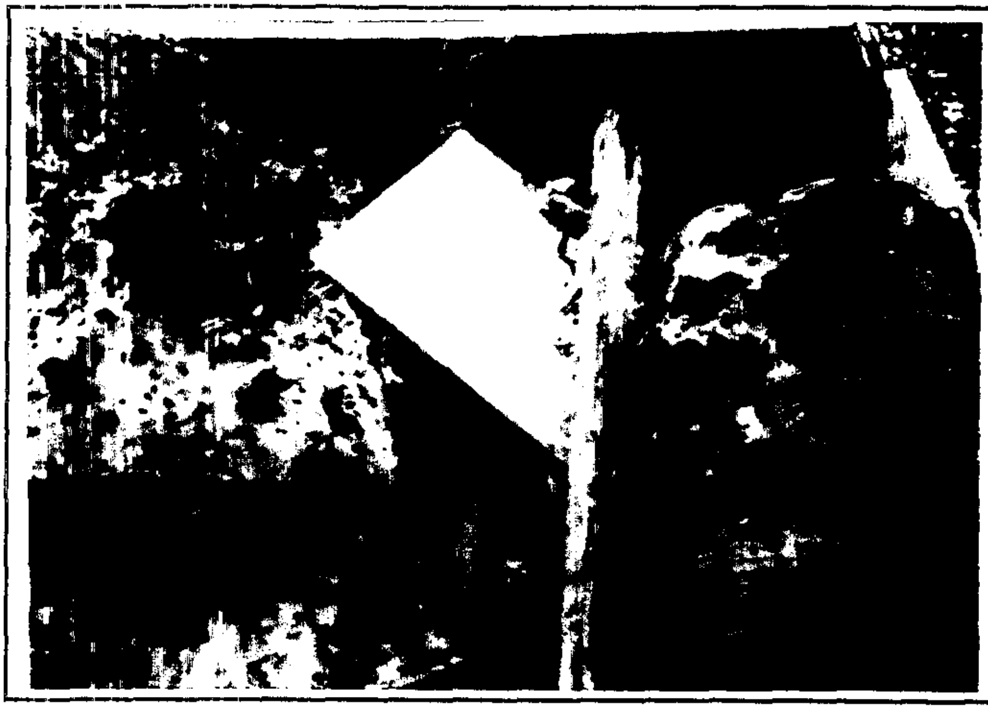


Photo 74. Hanford Firing Range Point and Target Area Site. Metal Debris

SECTION 3

V-0307-01

Expedited Response Action
Phase 2
Field Activities Report
Hanford-North Slope

October 1994

U. S. Army Corps of Engineers
Walla Walla District
Building 614
Walla Walla, Washington 99362

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
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Kennewick, Washington 99336 • 1037
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SHANNON & WILSON, INC.

October 12, 1994 1954 - 1994

U.S. Army Corps of Engineers
Walla Walla District
Building 614
Walla Walla, Washington 99362

Attn: Mr. Randy Chong

RE: EXPEDITED RESPONSE ACTION PHASE 2 FIELD ACTIVITIES REPORT HANFORD - NORTH SLOPE

This Phase 2 Field Activity Report describes the work accomplished on the Hanford-North Slope during the period from July 22, 1994, to September 22, 1994. The initial statement of work for this project required concrete debris, building material, and trash removal at designated sites within the U.S. Department of Energy, Hanford-North Slope. Gravel backfilling of cisterns and bunkers; and concrete slurry backfilling of designated underground bunkers and water cisterns. The work areas are shown on Figure 1, and contract tasks are shown in Table 1.

The work was conducted by E.P. Johnson Construction & Environmental, Inc. (E.P. Johnson) and Shannon & Wilson, Inc. for the U.S. Army Corps of Engineers, Walla Walla District (Corps), under Contract No. DACW68-93-D-0003, Delivery Order No. 7. Observation of the removal work was performed by Shannon & Wilson, Inc. as a subcontractor to E.P. Johnson.

The goal of the expedited response action is to conduct remedial actions in areas accessible to the public at the Hanford-North Slope. The objective of the work is to clean the designated land of all tripping hazards and objectionable debris that may have been left behind from the demolition of old military and homestead sites. Objectionable debris is defined as man-made trash or debris that has no value as wildlife habitat, and has no cultural or environmental significance.

SITE BACKGROUND AND DESCRIPTION

The Hanford-North Slope consists of approximately 140 square miles of land north of the Columbia River across from the active area of the Hanford Site. The North Slope was homesteaded from the late 1800s until the government took control of this area in the early 1940s. Prior to government control of the North Slope, homesteaders used the land primarily for sheep and cattle grazing and for growing row crops and orchards. Wheat was grown on high ground away from the river. Grazing took place on land too arid for crops or too distant from water for irrigation.

Additional land acquisitions on the North Slope took place in the 1950s for construction of Nike Missile Air Defense System positions (PSN) and antiaircraft gun emplacements, as well as to increase the buffer zone between the public land and the production areas of the Hanford Site. A total of seven antiaircraft gun emplacements and three Nike Missile positions were located on the North Slope. The military sites were closed in the early 1960s. Many of the buildings were considered a potential hazard to the public and were torn down or decommissioned in the mid-1970s; evidence remains of many of these buildings.

With the recent change in mission at the Hanford Site from plutonium production to environmental cleanup, attention has been given to releasing "clean" tracts of land for other uses. Since 1975, the North Slope has been managed by the Washington State Department of Wildlife and the U.S. Fish and Wildlife Service. Some areas have been open to the public. Certain areas included in the wildlife management area have been opened to ranchers, who obtained grazing permits for cattle grazing. The eastern portion of the North Slope contains a wasteway used by local farmers to drain runoff.

Westinghouse Hanford Company (WHC) conducted an investigation of the North Slope in 1990. The report, *North Slope Investigation Report* (WHC 1990), identified 39 sites associated with military or homesteader activities on the Hanford-North Slope.

PROJECT ORGANIZATION AND RESPONSIBILITIES

Field activities were conducted by E.P. Johnson and Shannon & Wilson for the Corps. Work was performed in accordance with the approved Field Activities Plan and Site Health and Safety Plan developed for this project. The Shannon & Wilson field engineer observed the field activities. This individual was also responsible for alerting the Shannon & Wilson

Project Manager of any changed conditions, and acted as the Site Health and Safety Manager for E.P. Johnson and Shannon & Wilson personnel.

SITE ACTIVITIES

Overview

The primary tasks undertaken by the contractor, E.P. Johnson, and recorded by the field engineer were:

- Concrete, building material, and debris removal
- Cistern/septic tank/bunker backfilling

The field engineer's field notes are located in Appendix B

Site Access

The contractor was diligent in protecting the fragile, arid environment. Existing roads were used at all times, unless otherwise directed by the Corps. Vehicle widths did not exceed the width of the road, and the "mule" were often used for debris removal to reduce damage to the sagebrush/grasslands.

Documentation

Site activities were documented by the Shannon & Wilson field engineer. Observations were recorded in the format prescribed in the work plan and included in Appendix B.

Debris Removal

On Friday, July 22, 1994, personnel from E.P. Johnson, monitored by George R. Gardner of Shannon & Wilson, began debris removal. Appendix A is a listing of sites and their status at contract completion on September 22, 1994.

Cistern/Bunker Backfilling

The Wagon Road, Overlook, Stock Tank and Well, and Homestead cisterns were completely filled by September 7, 1994, with pit-run gravel from Central Pre-Mix Concrete Company in Mattawa, Washington. Nearly 100 cubic yards of pit-run gravel were hauled to fill the four cisterns. The underground valve box at the H-12-L site was filled with concrete slurry on September 12, 1994, along with underground vaults discovered at H-06-L and PSN 07/10.

FOLLOW-UP

Overview

The work described in this Phase 2 Field Activities Report and completed by E.P. Johnson and Shannon & Wilson closed out the work outlined in the statement of work for this phase. Some work outlined in the statements of work has not been completed. Table 1 shows a matrix of the completed and remaining tasks. A brief description of the tasks to be completed is outlined below.

Debris Removal

Debris removal was not completed at the following sites:

H-06-C Site
Homestead Cistern Site
Stock Tank and Well Site

The debris at the H-06-C site was in a deep pit, the bottom of which was covered with large rocks. Mike Remington and Dave Stanton of the Corps Safety Office visited the site on July 22, 1994, with Bill Zimmerman of E.P. Johnson. Mr. Zimmerman raised several safety issues concerning the rocks and steep sides of the disposal site. The Corps agreed that the safety issues were valid and met with representatives of DOE Safety. It was decided to eliminate this site from Phase 2. The decision to leave the trash at the Homestead Cistern and the Stock Tank and Well sites was made to preserve the culturally significant artifacts from the Homestead era.

Summary

The statement of work for the Phase 2 clean-up on the Hanford-North Slope identified 13 work sites in addition to 26 of the 39 sites listed in the Phase 1 statement of work and identified by WHC in their report (WHC 1990). Of these 39 sites, 38 were completely closed out during the two phases, only the H-06-C was not closed out.

We have appreciated the opportunity to be of service to you on this project. Should you have any comments or questions regarding this report, please contact us.

Sincerely,

SHANNON & WILSON, INC.

DEE J. BURRIE
STATE OF WASHINGTON
25903
REGISTERED
PROFESSIONAL ENGINEER
10/12/94

EXPIRES: 2/26/95

George R. Gardner
Senior Environmental Engineer

Dee J. Burrie, P.E.
Branch Manager

GRG:DJB:JFZ/grg

Enclosures: Table 1 - Task Completion Matrix (3 pages)
Figure 1 - Vicinity Map
Appendix A - Site Status Report
Appendix B - Field Reports
Appendix C - Photos
Appendix D - Important Information about Your Environmental Assessment Report

TABLE 1

TASK COMPLETION MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contaminated Soil	Slurry Backfill Septic Tanks/ Bunkers	Others
Phase 1A						
Hanford Firing Range Point and Target Area	A					
Dune Homestead	A[3]					
Stove Site	A[3]					
Power Pole 12-3 Site	A[3]		A			
H-12-L Site					D	
Wagon Road Site	A[3]		A,F			
Lonetree Homestead	A[3]					
erlook and Home-ead Site	A[3]		A[1]			
Coyote Bait Can	A[3]					
Phase 1B						
H-06-L					D	
PSN 07/10 Site		B				
PSN 04 Site		B				
PSN 01 Site		B				
Wasteway Site	A[3]		A[3]			
Clay Pit Cistern	A[3]		A[3]	C		
Cow Cistern	A[3]		A[3]			

TABLE 1 (continued)

TASK COMPLETION MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contami-nated Soil	Slurry Backfill Septic Tanks/ Bunkers	Others
Phase 1C						
Igloo Site	A					
Asphalt Batch Plant Site	A					
PSN 90 Site	A[2],F			C, A[4]		
WSDOT Gravel Pit, No. 47	A,F			C, A[4]		
H-83-L Site	A					
PSN 80 Site	A,F	B				
H-83-C Site	A,F	B				
81-R Site	A,F			C, A[4]		
PSN 72/82 Site	A,F	B			A[5]	
Bridge View Site	A,F					
PHASE 2A						
H-12-C Site	F					
H-12-R Site	F					
H-12-L Site	F				F	
PSN 12/14 Site	F	B				
PSN 12/14 Site (Motor Pool)	F					
PSN 12/14 Site (Military Dump)	F					
Homestead Cistern	F		F			
Stock Tank & Well	F		F			

TABLE 1 (continued)

TASK COMPLETION MATRIX

Site	Remove Debris	Excavate Well Structures	Backfill Cisterns	Sample/ Remove Contami-nated Soil	Slurry Backfill Septic Tanks/ Bunkers	Others
Phase 2A (CONT.)						
Asbestos Pipe Dump Site						H
PHASE 2B						
H-06-L Site	F					
PSN 04 Site	F				G	
PSN 04 Site (Radar Site)	F					
PSN 07/10 Site	F					
PHASE 2C						
Borrow Pit 56	F					
PSN 01 Site	F					
PHASE 2E						
H-06-C Site	F					
PHASE 2F						
H-83-L Site	F					

NOTE: A--Items from Requisition No. W68SBV-3228-DP01.
B--Items from Change #1 to Requisition No. W68SBV-3228-DP01.
C--Items from Requisition No. W68SBV-3244-DP01.
D--Items from Requisition No. W68SBV-3265-DP01.
E--Items from Delivery Order No. 4, DACW68-93-D-0002. (2.4, D Site Investigation & Work Plan Revision)
F--Items from Delivery Order No. 7, DACW68-94-D-0003.
G--Items from Delivery Order No. 2, DACW68-94-D-0001. (CDM)
H--Items from Purchase Order DACW68-94-M-3982. (Tektoniks)
[1] Two cisterns.
[2] Excluding concrete rubble.
[3] Additive Item No. 1
[4] Additive Item No. 2
[5] Additive Item No. 3

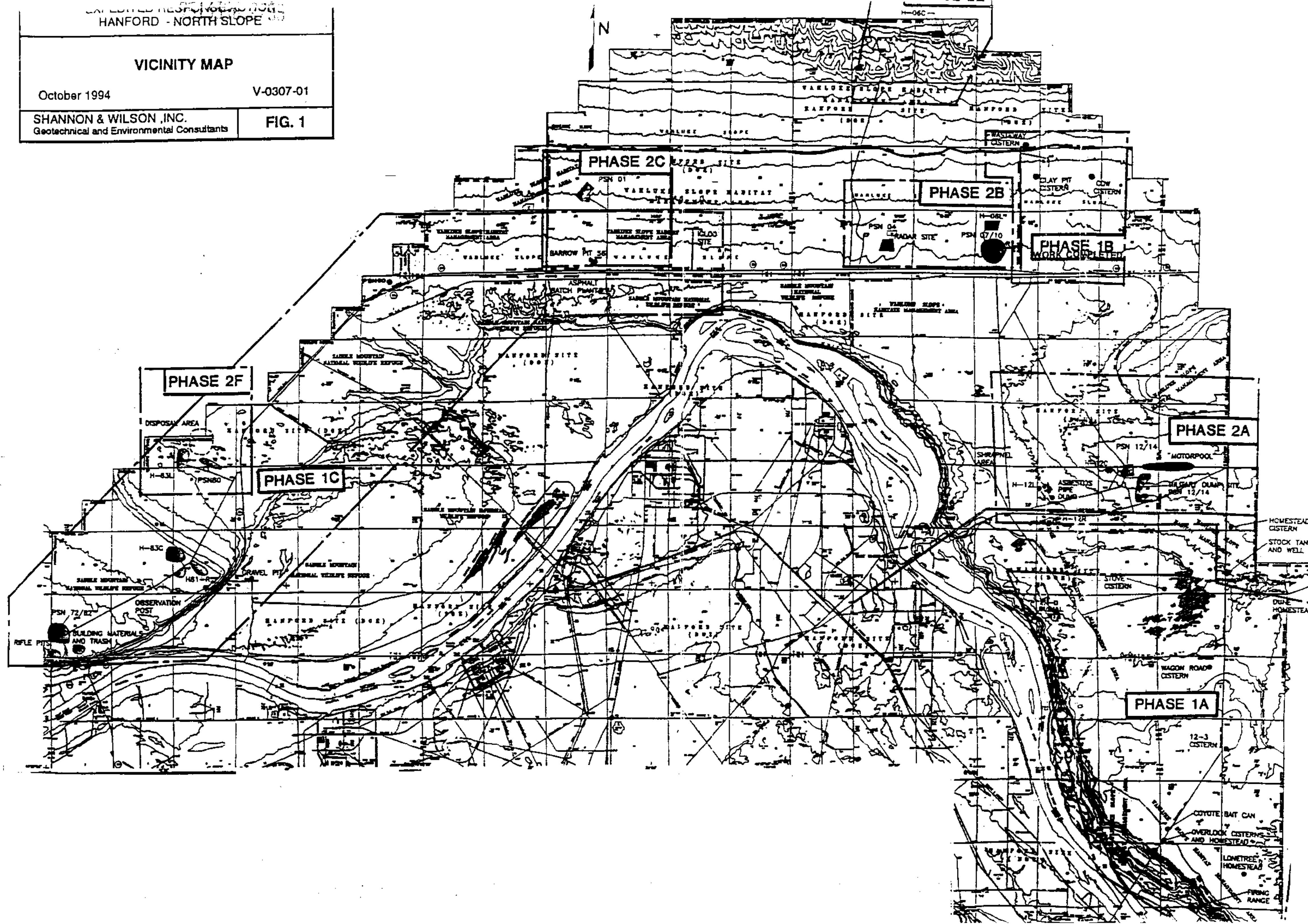
HANFORD - NORTH SLOPE

VICINITY MAP

October 1994 V-0307-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1



APPENDIX A

SITE STATUS REPORT

SITE STATUS REPORT, PHASE 1 AND PHASE 2

Phase 1A

Hanford Firing Range Point and Target Area Site: The only debris removed at this site were metal 55-gallon drums used as targets and other metal debris.

Dune Homestead: Debris removal was completed during Phase 1.

Stove Site: Debris removal was completed during Phase 1.

Power Pole 12-3 Site: Debris removal was completed during Phase 1. Cistern was also filled during Phase 1 with 5 cubic yards (cy) of pit-run gravel.

H-12-L Site: Debris removal was completed during Phase 2. The underground bunker was backfilled with slurry during Phase 1. The valve box was also backfilled with slurry during Phase 2.

'Vagon Road Cistern: Debris removal was completed during Phase 1. The debris at this site included glass bottles, tin cans, and other garbage. Filling the cistern took approximately 10 cy of pit-run gravel, and it was completed during Phase 2.

Lonetree Homestead: Debris removal was completed during Phase 1.

Overlook and Homestead Site: Debris removal was completed during Phase 1. Cistern was filled during Phase 2 with 55 cy of pit-run gravel.

Coyote Bait Can: Can removed during Phase 1

Phase 1B

H-06-L Site: Debris removal was completed during Phase 2. The underground bunker was backfilled with 29 cy of slurry during Phase 1. The debris removed from this site during Phase 2 included wire (mesh and barbed), concrete, sheet metal, and other debris. A small cistern was backfilled during Phase 2.

PSN 07/10 Site: Debris removal was completed during Phase 2. The debris at this site included ilding materials, cable, glass bottles, tin cans, barbed wire, and bags of garbage collected by others. Steel rebar and sections of steel pipe were cut off. Excavation around the concrete well structure was completed in Phase 1.

PSN 04 Site: Debris removal was completed under Phase 2. The debris at this site included building materials, glass bottles, tin cans, barbed wire, and other garbage. The contractor removed approximately 200 lineal feet of 1-inch steel cable from this site. Excavation around concrete well structure was completed in Phase 1. The septic tank was backfilled.

PSN 01 Site: Debris at this site included over a mile of barbed wire strung as a security fence around the site. Fencing removed also included a drop-bar gate at the entrance to the site with two sections of 6" reinforced concrete pipe. A large amount of wood that had been used to construct gravel walkways was also removed. Debris removal is complete. Excavation around the concrete well structure was completed in Phase 1.

Wasteway Cistern Site: Debris removal is complete. The debris at this site included glass bottles, tin cans, cable, concrete, and other garbage. Filling the cistern took approximately 33 cy of pit-run gravel.

Clay Pit Cistern Site: Debris removal is complete. The debris at this site included glass bottles, tin cans, asbestos pipe, and other garbage. Filling the cistern took approximately 2 cy of pit-run gravel. The asbestos pipe was removed in accordance with Paragraph 7.4 of the approved Contractor Health and Safety Plan.

Cow Cistern Site: Debris removal is complete. The debris at this site included glass bottles, tin cans, and other garbage. Filling the cistern took approximately 2 cy of pit-run gravel.

Phase 1C

Igloo Site: The debris at this site included a stock watering drum, glass bottles, tin cans, barbed wire, and other garbage. Debris removal is complete.

Asphalt Batch Plant Site: Debris removal is complete. The debris removed from this site during Phase 2 included asphalt, concrete, sheet metal and other debris.

PSN 90 Site: The site had contaminated soil, along with a large amount of concrete rubble from the demolished grease rack, several concrete pads, and some large sections of buried building materials, as directed by the contract documents. The debris removed at this site included building materials (asbestos shingles, concrete, and rebar), metal pipe, fence wire (barbed and mesh), and other garbage. The contaminated soil was removed by others. Some of the concrete debris was buried on site, and the rest was hauled to the DOE Concrete Recycling Facility under Phase 2. Steel rebar and sections of steel pipe were cut off.

WSDOT Gravel Pit, No. 47 Site: The debris was removed under Phase 2. The debris at this site included building materials, glass bottles, tin cans, paint cans, cable, concrete, and other garbage in the far pit. WSDOT removed the contaminated soil.

H-83-L Site: Debris removal, except wood, is complete. The debris at this site included building materials, galvanized cables and rods, glass bottles, tin cans, communications wire, and other garbage. A large pile of wood has been made and this will be burned by the U.S. Fish and Wildlife Service at a later date. With Corps direction, three bollards, with approximately 1 cubic yard of concrete on the end of each, were left to be removed at a later date. Three septic tank openings were discovered at this site and reported to the Corps for further action. A metal pipe with a flange on one end was left buried on this site. It was not determined what the pipe is connected with; it may be a buried fuel tank (photo 33, Appendix B, Phase 1 Report). During Phase 2, the bollards were buried in an old bunker, and the wooden debris was removed.

PSN 80 Site: The debris at this site included building materials, insulators, glass bottles, tin cans, cable, and other garbage. Five 55-gallon drums of contaminated soil were removed. Two septic tank openings were discovered at this site. These septic tanks were filled with 16 cy of concrete slurry under modification to the E.P. Johnson purchase order. Debris cleanup is complete. Excavation around the concrete well structure was completed in Phase 1

H-83-C Site: Debris removal is complete. The debris at this site included building materials, 20 tires, glass bottles, wire mesh, metal pipe, and other garbage. A septic tank opening was discovered at this site and was reported to the Corps for further action. Prior to the completion of work on December 22, 1993, this septic tank was filled with concrete slurry. A large metal door and eight sections of sheet metal wall were removed from this site. Excavation around the concrete well structure was completed in Phase 1.

H-81-R Site: The debris at this site included building materials (concrete debris and rebar), oil filters, metal pipes, glass bottles, tin cans, communications wire, and other garbage. Debris removal, except wood, is complete. Two large piles of wood have been made, and these were to be ;med by the U.S. Fish and Wildlife Service at a later date. Contaminated soil was removed and disposed of at the Richland Landfill. A rifle pit (bunker) was cleaned out and backfilled. The two large debris piles were never burned and were removed under Phase 2.

Position (PSN) 72/82 Site: The debris at this site included a large amount of building materials, such as bricks, railroad ties, bottles, cans, communications wire, cable, and other garbage. Debris cleanup is complete except for an old trailer frame shown in photo 14 of the Phase 1 Report. The septic tank received 39 cy of concrete slurry and is completely filled. Two rifle pits (bunkers), installed as security positions, were cleaned out and backfilled. Additional debris was removed from this site during Phase 2, and steel guy wires were cut off. Excavation around the concrete well structure was completed in Phase 1.

Bridge View Site: The debris at this site included building materials, wood, glass, wire mesh, and paper products. Debris removal as directed by the Corps is complete. Two large piles of wood had been made, and these were burned by the U.S. Fish and Wildlife Service. During Phase 2 additional debris was removed from this site after completion of landfill excavations by Camp Dresser & McKee, Inc. (CDM).

Phase 2A

H-12-C Site: Debris removal was completed during Phase 2. The debris at this site included building materials, cable, glass bottles, tin cans, and barbed wire.

H-12-R Site: Debris removal was completed during Phase 2. The debris at this site included building materials, cable, glass bottles, tin cans, barbed wire, and auto parts.

H-12-L Site: See Phase 1A above.

PSN 12/14 Site: Debris removal was completed during Phase 2. The soil was excavated around the well structure during Phase 1. Excavation around the concrete well structure was completed in Phase 1.

PSN 12/14 Site (Motor Pool): Debris removal was completed during Phase 2. The debris at this site included building materials, cable, glass bottles, tin cans, barbed wire, and auto parts.

PSN 12/14 Site (Military Dump): During Phase 2, debris was removed from this site after completion of landfill excavations by CDM. The debris included building materials, cable, glass bottles, tin cans, barbed wire, and auto parts. Debris removal was completed during Phase 2.

Homestead Cistern: No debris was removed from this site. The cistern was backfilled with 3 cy of pit-run gravel.

Stock Tank & Well Site: No debris was removed from this site. The cistern was backfilled with 25 cy of pit-run gravel.

Phase 2B

H-06-L Site: See Phase 1B above.

PSN 04 Site: See Phase 1B above.

PSN 04 (Radar) Site: Debris removed included wooden construction materials, metal pipe, timbers, bottles, cans, barbed wire and mesh fencing, fence posts, aluminum siding, communications wire, and tires. Several items were stockpiled on visqueen as potentially hazardous: a crushed 55-gallon oil can with residue and stained soil; three fluorescent light fixtures with ballasts; six asbestos-lined brake shoes; an auto battery; and an oil filter.

PSN 07/10 Site: See Phase 1B above.

Phase 2C

Barrow Pit 56 Site: Debris removed included communications wire, timbers, bottles, cans, barbed wire fencing, and fence posts. Several items were stockpiled on visqueen as potentially hazardous: one 5-gallon oil can full of dead beetle (possible herbicide/insecticide) and two 5-gallon oil cans with liquid.

PSN 01 Site: See Phase 1C above.

Phase 2E

H-06-C Site: This site was removed from Expedited Response Action - Phase 2 due to serious safety concerns. However debris was removed from along the road connecting this site with PSN 04.

Phase 2F

I-83-L Site: See Phase 1C above.

APPENDIX B

FIELD REPORTS

Daily QA Report

Date: July 22, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner (Shannon & Wilson, Inc.)

Weather Conditions:
90 °F, wind 3 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on site: William Zimmerman & Ken Linck (E.P. Johnson); Paul Ching & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 07/10) at 0600 hours July 22, 1994 and was met by Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman and Ken Linck of E.P. Johnson, a safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and signed the field log. The E.P. Johnson personnel went to Othello and returned at 0730 hours and started picking up trash on the east side of PSN 07/10, this site had been excavated during the landfill investigation and debris was left on the surface. Concrete debris was discovered and marked along with several paint cans with paint residue. Wire and angle iron embedded in the ground was marked for removal with the ATV/CART mover with hoist. At 1000 hours Randy Chong (Corps) and Ken Artz, Hank Henry, and Jeff Evert (ICF Kaiser) arrived at the site and removed four drums of TPH and Lead contaminated soil. At 1045 hours, the truck was full and at 1100 hours Dave Stanton (Corps) arrived. At 1105 Dave Stanton, Paul Ching, and the E.P. Johnson personnel left the site enroute to the DOE Central Landfill and Concrete Recycler facilities on the Hanford Site in the vicinity of the 200 Areas. They also planned to visit the DOE tire recycling area located in building 1171 in the 1100 Area. The rest of the day was be spent in coordination with personnel at these facilities and a safety assessment of a portion of the H-06C site with Mike Remington of the Corps Safety Office. All personnel then left the site and Claude Huckins locked the gate.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: July 22, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: July 25, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner (Shannon & Wilson, Inc.)

Weather Conditions:
90 °F, wind 8 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on site: William Zimmerman & Ken Linck (E.P. Johnson); Paul Ching, Bill Jennings, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 72/82) at 0630 hours July 25, 1994 and met Claude Huckins and Bill Jennings from Hanford Resident Office of the Walla Walla District and Bill Zimmerman and Ken Linck of E.P. Johnson. The E.P. Johnson personnel were removing fence posts and barbed wire from north of the well. Paint cans were discovered at two locations with paint residue, these were marked. Several solvent cans and an oil filter were discovered and evaluated, the RCRA empty cans were removed but the others were marked with a lath and flagging. The ATV/CART (Mule) eased trash removal somewhat however it now requires double handling of every piece of wood or other trash. At 0800 hours the PSN 72/82 site was clean and the crew moved on to the Bridge View Site. At 0935 hours, the truck was full and Bill and Ken left along with Paul Ching for the DOE Central Landfill.. At 1105 the E.P. Johnson personnel returned and made four more trips with the Mule. The truck was loaded by 1235 hours and Ken took the load to the landfill. Paul Ching accompanied him and Claude and Bill performed a reconnaissance of the H-81-R and H-83-C sites for work on July 26, 1994. All personnel then left the site and Claude Huckins locked the gate.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: July 25, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: July 26, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner (Shannon & Wilson, Inc.)

Weather Conditions:
90 °F, wind 8 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching, Bill Jennings, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (Bridge View site) at 0610 hours July 26, 1994. Claude Huckins and Bill Jennings from Hanford Resident Office of the Walla Walla District and Bill Zimmerman and Ken Linck of E.P. Johnson arrived at 0640 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel started removing fence posts and wire from the Bridge View site. Paint cans were discovered at two locations with paint residue, these were marked. At 0941 hours, the truck was full and Ken left along with Paul Ching for the DOE Central Landfill. At 1059 the E.P. Johnson personnel returned along with Corey and made two more trips with the Mule to the Overlook site. At 1230 hours, Paul Ching declared the Bridge View site clean and the crew moved along the road to the H-81-R and H-83-C. The crew picked up wooden fence post, TV tubes, cans, construction material, and empty oil cans. The truck was loaded by 1305 hours and Ken took the load to the landfill. Paul Ching accompanied him. Corey and Bill hauled two loads of wooden construction material out of the H-81-R site and stockpiled it along the road for pickup on July 27, 1994. All personnel then left the site and Claude Huckins locked the gate.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: July 26, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: July 27, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner (Shannon & Wilson, Inc.)

Weather Conditions:
95 °F, wind 8 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching, Bill Jennings, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-81-R) at 0610 hours July 27, 1994. Claude Huckins and Bill Jennings from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0600 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel started removing wooden construction materials from the H-81-R site. At 0730 hours, the truck was full and the site was clean. The crew moved to the H-83-C site and stockpiled metal roofing material and wire, this was completed at 0815 hours and the site was cleared with the exception of filling the cistern and cutting two pieces of rebar. The crew moved down to the PSN 80 site and at 0857 Ken and Paul took the first load to the DOE Central Landfill. At 1030 the truck returned to the H-83-C site and loaded the stockpiled trash. It returned to PSN 80 at 1215 hours, the truck was loaded by 1235 hours and Ken took the load to the landfill. Paul Ching accompanied him. Corey and Bill hauled several loads of wooden construction material, commo wire, fencing and tin cans and stockpiled it along the road it was loaded in the truck when Ken returned with the truck at 1345. All personnel left the site at 1430 hours and Claude Huckins locked the gate.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: July 27, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: July 28, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner (Shannon & Wilson, Inc.)

Weather Conditions:
85 °F, wind 8 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 80) at 0610 hours July 28, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and signed. The E.P. Johnson personnel completed loading the truck with wooden construction materials, fencing wire, 55-gallon drums, bottles, cans, and a washing machine from the PSN 80 site. At 0650 hours, the truck was full and Ken took the first load to the DOE Central Landfill. Bill and Corey hauled several loads and stockpiled them. At 0902 the truck returned to the PSN 80 site and loaded the stockpiled trash. At 1000 hours, the truck is loaded with cans, bottles, fencing wire and wood construction material and Ken took the load to the landfill. Corey and Bill hauled several loads of wooden construction material, commo wire, fencing and tin cans and stockpiled it along the road it was loaded in the truck when Ken returned with the truck at 1115. All personnel then left the site at 1430 hours and Claude Huckins locked the gate.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: three treated railroad ties were found about 500 meters NM of PSN 80,

Daily QA Report

Date: July 28, 1994

6 grease pails with residue were also discovered and flagged. E.P. Johnson also found 2 used oil filters and a pressure treated fence post which they marked.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: July 29, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner (Shannon & Wilson, Inc.)

Weather Conditions:
90 °F, wind 5 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching & Claude Huckins (Corps)

Equipment on Site: Chevrolet ¾-ton pickup w/trailer & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 80) at 0630 hours July 29, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman of E.P. Johnson had left the site to start a tour of the sites listed in the scope of work of this task order. Field Engineer and Paul Ching joined the tour at PSN 01 and all spent the rest of the day walking down the sites. Of particular interest was the Stock Tank and the PSN 12/14 sites. Corey Prior and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and signed. The E.P. Johnson personnel stockpiled wooden construction materials, fencing wire, bottles, cans, concrete culvert, and concrete block from the PSN 80 site. Corey and Ken found a run of commo wire from H-83-L to H-83-C and removed it and stockpiled it along the road. All personnel then left the site at 1430 hours and Claude Huckins locked the gate.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: July 29, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 1, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, clear and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 80) at 0610 hours August 1, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and signed. The E.P. Johnson personnel loaded the truck with wooden construction materials, fencing wire, bottles, cans, and commo wire from the PSN 80 site. At 0715 hours, the truck was full and Ken took the first load to the DOE Central Landfill. Klint and Corey hauled several loads with the mule and stockpiled them. At 0905 the truck returned to the PSN 80 site and loaded the stockpiled concrete culvert and concrete block. At 1020 hours, the truck is loaded with concrete and Ken took the load to the Concrete Recycling Facility. Paul Ching went along. Corey and Klint continued hauling commo wire, fencing and tin cans and stockpiled it along the road. Klint and Corey mobilized to PSN 90 at 1100 hours and PSN 80 was cleaned up with the exception of the commo wire, fencing and tin cans previously stockpiled. All personnel then left the site at 1430 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: August 1, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: 2 used oil filters and a pressure treated fence post which they marked.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 2, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, smokey haze and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps)

Equipment on Site: IH S1900 Dump Truck, ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 90) at 0610 hours August 2, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and signed. The E.P. Johnson personnel loaded the truck with wooden construction materials, fencing wire, bottles, cans, and commo wire from the PSN 80 site and the material stockpiled at the PSN 90 site. At 0700 hours, the truck was full and Ken took the first load to the DOE Central Landfill. Klint and Corey hauled several loads with the mule and stockpiled them. At 0905 the truck returned to the PSN 90 site and loaded the stockpiled metal roofing, timbers, bottles, cans, and sand bags. At 0945 hours, the truck is loaded with the trash and Ken took the load to the DOE CLF. Paul Ching went along. Corey and Klint continued hauling barbed wire fencing, fence post, aluminum siding, and tin cans and stockpiled it along the road. At 1105 the truck returned to the PSN 90 site and loaded the stockpiled barbed wire fencing, fence post, aluminum siding, and tin cans. At 1125 hours, the truck is loaded with the trash and Ken took the load to the DOE CLF. Corey, Bill, and Klint continued hauling barbed wire fencing, fence post, aluminum siding, and tin cans and stockpiled it along the road. At 1252 the truck returned to the PSN 90 site and loaded the stockpiled barbed wire fencing, fence post, aluminum siding, and tin cans. At 1310 hours, the truck is loaded and Ken took the load to the DOE CLF and then to Pasco. Corey, Bill, and Klint continued hauling barbed wire fencing, fence post, wooden construction material, and tin cans and stockpiled it along the road. All personnel then left the site at 1430 hours.

Daily QA Report

Date: August 2, 1994

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: a transmission casing and piece of asbestos pipe which they marked.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 3, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 90) at 0600 hours August 3, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel loaded the truck with wooden construction materials, fencing wire, bottles, cans, and fence posts from the PSN 90 site. At 0800 hours, the truck was full and Ken took the first load to the DOE CLF. Bill and Corey moved to WSDOT Pit 47 site and began stockpiling wooden construction material and wire. At 1000 the truck returned to the Pit 47 site and loaded the stockpiled timbers, and wire. At 1145 hours, the truck is loaded with the trash and Ken took the load to the DOE CLF. Paul Ching went along. Bill and Corey moved to the Pit 56 site and collected barbed wire fencing, fence posts, commo wire, and tin cans and stockpiled it along the road. All personnel then left the site at 1430 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: a treated 4"x4" timber and a grease can.

Daily QA Report

Date: August 3, 1994

Quality Control Activities Conducted:
Received word to fill in small pit at the WSDOT Pit 47 site that contained cans, bottles, and cable.

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 4, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (Asphalt Batch Plant) at 0610 hours August 4, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel loaded the truck with wooden construction materials, fencing wire, bottles, and cans from the Asphalt Batch Plant site. At 0800 hours, the truck was full and Ken took the first load to the DOE CLF. Bill and Corey hauled several loads with the mule from Pit 56 and stockpiled them. At 0935 the truck returned to the Pit 56 site and loaded the stockpiled timbers, bottles, cans, and commo wire. At 1135 hours, the truck is loaded and Ken took the load to the DOE CLF. Bill and Corey continued hauling barbed wire fencing, fence post, and tin cans and stockpiled it along the road. At 1245 the Mule had a flat tire and Bill and Corey left the site at 1300 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: at Asphalt Batch Plant Site - 2 oil filters and several pieces of treated timber and at Pit 56 - a 5-gallon oil can full of dead beetles (possible herbicide/insecticide) and two 5-gallon oil cans with liquid.

Daily QA Report

Date: August 4, 1994

Quality Control Activities Conducted:
Both the Pit 56 and Asphalt Batch Plant sites are clean.

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 5, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, and sunny.

Observations/Comments:
Personnel on Site: Bill Zimmerman & Corey Prior (E.P. Johnson); Paul Ching, Claude Huckins, & Bill Jennings (Corps)

Equipment on Site: Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-06-L) at 0700 hours August 5, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman and Corey Prior of E.P. Johnson arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and signed. The E.P. Johnson personnel stockpiled 2 wooden fence posts and fencing wire at the PSN 72/82 and commo wire at the Pit 56 site. At 0700 hours, Bill and Corey hauled loads with the mule and stockpiled them at H-06-L Site. These activities continued all day. All personnel then left the site at 1430 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: 5 paint cans (red, green {2}, yellow, and white) and a 4"x4" treated timber.

Quality Control Activities Conducted:
Work at PSN 72/82 and Pit 56 were in response to comments from DOE site walk down conducted on August 4, 1994.

Daily QA Report

Date: August 5, 1994

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 8, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 7-15 knots out of the West, haze and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching, Claude Huckins, & Bill Jennings (Corps)

Equipment on Site: IH S1900 Dump Truck w/trailer, Ford 555D Backhoe, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-06-L) at 0600 hours August 8, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Corey Prior, and Ken Linck of E.P. Johnson arrived at WSDOT Pit 47 site at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel backfilled the pit at Pit 47 with the backhoe and moved to PSN 90. Field engineer and backhoe operator buried concrete at PSN 90. At 0850 hours, the truck was full and Ken took the first load to the DOE CLF. Bill and Corey hauled several loads at H-06-L with the mule and stockpiled them. At 1100 hours, the truck returned to the H-06-L site and loaded the stockpiled metal roofing, timbers, bottles, cans, and sand bags. At 1100 hours, the truck was full and Klint started stockpiling the concrete. The truck is loaded by 1135 and Ken took the load to the DOE CLF. Corey and Bill continued hauling barbed wire fencing, fence posts, tin cans, and bottles and stockpiled it along the road. At 1300 hours, all personnel left the site.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: August 8, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 9, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-83-L) at 0700 hours August 9, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, and Ken Linck of E.P. Johnson had arrived at 0530 hours. A safety meeting was held and the work scheduled for the day was discussed. During the safety meeting the Site Health and Safety Plan was reviewed and daily log was signed. The E.P. Johnson personnel loaded the truck with wooden construction materials, fencing wire, bottles, cans, and metal siding from the material stockpiled at the PSN 90 site using the backhoe on August 8. At 0730 hours, the truck was full and Ken took the first load to the DOE CLF. Bill and Corey used a hot saw and the mule to cut off rebar and guy wires at PSN 90, H-83-C, H-83-L, and PSN 80. At 0905 the truck returned to the PSN 80 site and loaded the stockpiled rebar, guy wires, bottles, and cans. At 1145 hours, the truck is loaded and Ken took the load to the DOE CLF the headed to Pasco. Bill and Corey continued hauling barbed wire fencing, fence post, aluminum siding, and tin cans and stockpiled it along the road at PSN 04. At 1300, all personnel left the site.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: August 9, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 10, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 15-20 knots out of the West, and sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 04) at 0700 hours August 10, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, and Ken Linck of E.P. Johnson arrived at 0530 hours. A safety meeting had been held and the work scheduled for the day discussed. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel loaded the truck with wooden construction materials, fencing wire, bottles, cans, and commo wire from the PSN 04 site. At 1200 hours, the truck was full and Ken took the load to the DOE CLF, he continued on to the Pasco office. Bill and Corey hauled several loads with the mule and stockpiled them, including tires, wire, bottles and cans. All personnel then left the site at 1230 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: a crushed 55-gallon oil can w/residue and stained soil; 3 florescent light fixtures with ballasts; 6 asbestos lined brake shoes; an auto battery; and an oil filter.

Daily QA Report

Date: August 10, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 11, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps)

Equipment on Site: IH S1900 Dump Truck w/trailer, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-83-L) at 0630 hours August 11, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Klint Johnson and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0530 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel using the JD 190E were excavating an old bunker and then placing the three concrete bollards that remained on this site from Phase I in the excavation and backfilling it. When this was complete, the dump truck w/trailer and JD 190E moved to PSN 90 and loaded the truck with concrete debris. At 1100 hours, the truck was full and Ken took the load to the DOE Concrete Recycling Facility. Paul Ching went along. Bill and Corey (at PSN 04) hauled several loads with the mule and stockpiled them. The stockpiled material included metal pipe, timbers, bottles, cans, and wire fencing (mesh and Barbed). At 1315 hours, the truck returned and the crew moved the equipment back to Pasco. All personnel then left the site at 1330 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: August 11, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 16, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
95 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps); Joe Kriete (Grant County Deputy Sheriff)

Equipment on Site: IH S1900 Dump Truck w/trailer, John Deere 190E Trackhoe, & Chevrolet ¾-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-06-L) at 0700 hours August 16, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, Klint Johnson, and Ken Linck of E.P. Johnson were on site. Joe Kriete, Deputy Sheriff(Grant County) was also on site to provide security after E.P. Johnson and the Corps received threats from an individual on August 12, 1994. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The E.P. Johnson personnel using the JD 190E were loading concrete from H-06-L. When this was complete, the dump truck with the concrete debris departed for the Concrete Recycling Facility (0850 hours). At 1100 hours, the truck returned and Klint and Ken took the load to the DOE Concrete Recycling Facility at 1230 hours. Bill and Corey (at PSN 07/10) marked loads for the mule and flagged them. The flagged material included metal pipe, timbers, bottles, cans, and wire fencing (mesh and Barbed). All personnel then left the site at 1330 hours.

Field Analysis Performed: (Instrument checks. Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
On August 15, 1994, the E.P Johnson crew along with a Grant County Deputy Sheriff assembled at PSN 90 and loaded the concrete that remained there and transported it to the DOE Concrete Recycling Facility.

Daily QA Report

Date: August 16, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 17, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps); Joe Kriete (Grant County Deputy Sheriff)

Equipment on Site: IH S1900 Dump Truck w/trailer, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 07/10) at 0700 hours August 17, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, Klint Johnson, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0530 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Joe Kriete, a Deputy Sheriff from Grant County was also present. The E.P. Johnson personnel using the JD 190E were loading concrete into the dump truck. When this was complete (1040 hours), Klint and Ken took the load to the DOE Concrete Recycling Facility. Bill and Corey hauled numerous loads with the mule and stockpiled them. The stockpiled material included metal pipe, timbers, bottles, cans, and wire fencing (mesh and barbed). At 1300 hours, the truck returned to PSN 04 and loaded the trash that remained there and the dump truck headed for the CLF at 1330. All personnel then left the site at 1430 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
At approximately 1000 hours, Ken Linck of E.P. Johnson discovered two open plastic bags with syringes inside, Joe Kriete, Deputy Sheriff, Grant County (who was on site for security reason) picked up the bags and syringes and secured them in an evidence bag for disposal at his office.

Daily QA Report

Date: August 17, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 18, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, & Ken Linck (E.P. Johnson); Paul Ching (Corps); Rick Canterbury (Grant County Deputy Sheriff)

Equipment on Site: IH S1900 Dump Truck w/trailer, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, & Kawasaki Mule 2510 ATV.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 07/10) at 0730 hours August 18, 1994. Paul Ching from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, Klint Johnson and Ken Linck of E.P. Johnson were on site. Rick Canterbury a Deputy Sheriff from Grant County was also on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Klint and Ken made a run to the CLF as soon as they loaded some of the wooden construction material stockpiled at PSN 07/10. They had stopped at the CLF at 1400 hours on August 17, 1994 and found it closed. The E.P. Johnson personnel (Bill and Corey) left for a reconnaissance to Homestead Cistern, Stock Tank and Well Site, Wagon Road Cistern and Overlook Cistern to verify the quanities of gravel backfill required. They returned to PSN 07/10 at 0900 and started stockpiling trash (tent, fence posts, barbed wire, bottles/cans, metal siding, stove pipe, and wooden construction material). At 1015 hours, Klint and Ken returned from the CLF and started loading concrete using the JD 190E trackhoe. At 1215 hours, the truck was full and Ken took the load to the DOE Concrete Recycling Facility. Bill and Corey (at PSN 07/10) continued to haul loads with the mule and stockpile them. At 1400 Bill and Corey left the site for Pasco. Klint and Ken returned and picked up the trailer and also left.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: <u>August 18, 1994</u>

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
<u>During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: two treated timbers and an oil filter.</u>

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
<u>Field engineer and workers were in Level D for all trash removal.</u>

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 24, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, Ken Linck, Larry Schouten, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching, Claude Huckins, & Bill Jennings (Corps); Joe Kriete (Grant County Deputy Sheriff)

Equipment on Site: IH S1900 Dump Truck w/trailer, Case 590 Backhoe, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Ford ¾-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-12-L) at 1230 hours August 24, 1994. Paul Ching, Claude Huckins, and Bill Jennings from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, Klint Johnson, Ken Linck, Larry Schouten, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. Joe Kriete, a Deputy Sheriff from Grant County, was also on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Klint and Ken made a run to the CLF as soon as they loaded some of the wooden construction material, barbed wire, commo wire, bottles, and cans stockpiled at H-12-L. Larry and Dale hauled 5 loads of gravel backfill from the H-12-L site to the Overlook Cistern (at approximately 8 cubic yards per load) cistern is now two thirds full. Tina and Bill stockpiling trash (fence posts, barbed wire, bottles/cans, metal siding, stove pipe, and wooden construction material). At 1015 hours, Klint and Ken returned from the CLF and started loading concrete using the JD 190E trackhoe. At 1215 hours, the truck was full and Ken and Corey took the load to the DOE Concrete Recycling Facility. Bill, Tina, and Klint (at H-12-L) continued to haul loads with the mule and stockpile them. At 1400 Bill and Corey left the site for Pasco. Klint and Ken moved the trackhoe up to PSN 12/14 and also left. Larry, Tina, and Dale headed for Pasco after the 5th load to the Overlook Cistern.

Daily QA Report

Date: August 24, 1994

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: two treated timbers and an oil filter.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 25, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, Ken Linck, Larry Schouten, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching, Claude Huckins, & Bill Jennings (Corps); Rick Canterbury (Grant County Deputy Sheriff)

Equipment on Site: IH S1900 Dump Truck w/trailer, Case 590 Backhoe, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Ford ¾-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-12-C) at 0630 hours August 25, 1994. Paul Ching, Claude Huckins, and Bill Jennings from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, Klint Johnson, Ken Linck, Larry Schouten, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. Rick Canterbury, a Deputy Sheriff from Grant County, was also on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Klint and Ken loaded concrete using the JD 190E Trackhoe from H-06-C and PSN 12/14. Larry, Tina, and Dale hauled 6 loads of gravel backfill (with the Case 590 Backhoe) from the stockpile at the PSN 12/14 site to the Stock Tank and Well Cistern (at approximately 1 cubic yards per load) cistern is now one third full. Corey and Bill stockpiling trash (fence posts, barbed wire, bottles/cans, metal siding, stove pipe, and wooden construction material). At 0900 hours, Ken hauled the stockpiled trash to the CLF. At 1215 hours, when the truck was full of concrete debris, Ken and Klint took the load to the DOE Concrete Recycling Facility. All personnel left the site at 1430 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: August 25, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems. Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: numerous paint cans and treated 4"x4" timbers.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 26, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Corey Prior, Ken Linck, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching & Claude Huckins (Corps); Dave Taylor (Grant County Deputy Sheriff)

Equipment on Site: IH S1900 Dump Truck, IH S1900 Dump Truck w/trailer, Case 590 Backhoe, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 12/14) at 0630 hours August 26, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Corey Prior, Klint Johnson, Ken Linck, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. Dave Taylor, a Deputy Sheriff from Grant County, was also on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Tina and Dale hauled six loads of gravel backfill to the Stock Tank and Well Cistern with the Case 590 Backhoe (approximately one cubic yard per load) cistern is now two thirds full. Klint and Ken continued to load concrete in one dump truck with the JD 190E Trackhoe and took a load to the Concrete Recycling Facility at 1200. Bill and Corey stockpiled trash and took one load to the CLF. They left the site at 1200 hours. All other personnel left site at 1430 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: August 26, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: two treated timbers and an oil filter.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 29, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: Ken Linck, Larry Schouten, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, IH S1900 Dump Truck w/trailer, Case 590 Backhoe, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Ford ¾-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 12/14) at 0630 hours August 29, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Larry Schouten, Ken Linck, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Dale and Ken picked up concrete at PSN 12/14 and loaded it into the dump truck, they took a load to the dump at 1200 hours. Larry and Tina loaded trash (bottles, cans, wooden construction materials, and wire) into the second dump truck and hauled a load to the CLF.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Daily QA Report

Date: August 29, 1994

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: August 30, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: Klint Johnson, Corey Prior, Ken Linck, Larry Schouten, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching, Claude Huckins, & Bill Jennings (Corps)

Equipment on Site: IH S1900 Dump Truck, IH S1900 Dump Truck w/trailer, Case 590 Backhoe, John Deere 190E Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 12/14) at 0630 hours August 30, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Corey Prior, Klint Johnson, Ken Linck, Larry Schouten, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Dale took loaded dump truck to CLF. Larry and Tina picked up trash along road between crossroads and PSN 12/14. Klint loaded concrete into the second dumptruck. Corey and Ken stockpiled trash including metal siding. At 1030, dump truck returned and Dale took second load to CLF. Ken took load of concrete to Concrete Recycling Facility. Corey and Klint found extensive new dump site approximately 1000 meters north of the well at PSN 12/14. All personnel left site at 1430 hours.

Field Analysis Performed: (Instrument checks. Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson flagged several items that were outside their scope of work: paint cans, oils filters and treated timbers..

Daily QA Report

Date: August 30, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 6, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 7, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
75 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Eddenn, Ken Linck, Larry Schouten, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, IH S1900 Dump Truck w/trailer, Case 590 Backhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, Ford ¾-ton pickup, & Ford ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 07/10) at 0700 hours September 7, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Mark Edden, Klint Johnson, Ken Linck, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Tina and Dale completed hauling gravel backfill to the Stock Tank and Well Site. Tina, Dale, Larry, and Mark raked out all signs of haul routes into the Stock Tank and Well and Homestead Cisterns. Crew moved to PSN 12/14 and dug up an old burn barrel and several treated railroad ties. Ken, Bill, and Klint worked on cutting off steel fence posts and rebar at the H-06-L site. They collected trash and tires and at 1027, Ken took a load of wire, telephone poles, and bottles and cans to the CLF. At 1345 Tina, Bill, Larry, Dale, and Mark moved to PSN 04 and worked on trash pickup. Crew left site at 1630 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: September 7, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
During the stockpiling of the debris, E.P. Johnson stockpiled several items that were outside their scope of work at PSN 04 and H-06-L.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 8, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, Larry Schouten, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, Ford ¾-ton pickup, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 07/10) at 0630 hours September 8, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Mark Edden, Klint Johnson, Ken Linck, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Klint and Ken cut rebar and steel fence posts at H-06-L using a Black and Decker power hack saw, completed work at 0830 hours and moved to PSN 07/10 and cut guy wires, rebar, and other wire with hack saw. Larry, Tina , and Dale picked up trash along the road between PSN 04 and H-06-C. Mark and Bill picked up trash along the road from Hwy 24 to PSN 04. Dump truck was full at 1030 and Ken took it to the dump. Larry and Dale left site with the second IH S1900 Dump Truck. Klint and Tina moved over to PSN 12/14 and cut steel at that site then move over to H-12-C and cut steel at that location. Bill and Mark finished at PSN 04 and moved to PSN 12/14 and started moving the last of the trash from this site. Contractor left site at 1630 hours.

Field Analysis Performed: (Instrument checks. Calibration)
None.

Daily QA Report

Date: September 8, 1994

Problems Encountered/Corrective Actions (Specify Sampling Problems. Alternative Methods Used and any Deviation From Planned Activities)

During the stockpiling of the debris, E.P. Johnson stockpiled on visqueen several items that were outside their scope of work at PSN 04, PSN 07/10, H-06-L, PSN 12/14, H-12-L, and H-12-C.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:

Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 9, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
75 °F, wind 15 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Ken Linck, Larry Schouten, Tina Westermeyer, Mark Edden, & Dale Cadieu (E.P. Johnson); Paul Ching, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, Ford ¾-ton pickup, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 07/10) at 0630 hours September 9, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Mark Eaton, Klint Johnson, Ken Linck, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Started trash removal at H-12-R, crew spent entire day stockpiling trash at this site. Ken made one trip to the DOE CLF. Bill and Mark continued cutting off steel guy wires and posts at PSN 07/10. Crew left site at 1630 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Daily QA Report

Date: September 9, 1994

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 12, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Eaton, Ken Linck, Larry Schouten, Dale Kadieu, & Tina Westermeyer (E.P. Johnson); Paul Ching, Claude Huckins, & Bill Jennings (Corps))

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, Ford ¾-ton pickup, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-12-R) at 0630 hours September 12, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Mark Edden, Klint Johnson, Ken Linck, Dale Kadieu, Larry Schouten, and Tina Westermeyer of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Continued trash removal at H-12-R. Crew spent afternoon at PSN 72/82, PSN 80 and PSN 07/10 sites stockpiling paint cans and potentially hazardous material on sheets of visqueen. Ken made one trip to the DOE CLF from this site. Slurry backfilled holes at PSN 07/10, H-06-L, and H-12-L. Crew left site at 1630 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: September 12, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 13, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
75 °F, wind 15 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Ken Linck, & Mark Edden (E.P. Johnson); Paul Ching, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-12-R) at 0630 hours September 13, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Mark Edden, Klint Johnson, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. Continued trash removal at H-12-R, crew spent entire day stockpiling trash at this site. Ken made one trip to the DOE CLF. Bill and Mark started stockpiling paint cans and potentially hazardous material on visqueen at PSN 07/10, H-12-L, H-12-C, and PSN 12/14. Crew left site at 1630 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Daily QA Report

Date: September 13, 1994

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 15, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, & Tina Westermeyer(E.P. Johnson); Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck w/trailer, Kubota KX 101 Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-12-R) at 0700 hours September 15, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Mark Edden, Tina Westermeyer, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The crew loaded the dump truck with auto parts, commo wire, fence posts, and fence wire. Metal roofing material was loaded into the E.P. Johnson pickup to be recycled off post. Several small pieces of concrete were buried at the site using the Kubota trackhoe. The crew also spent time covering up tracks using a rake. Mark and Bill moved on to H-12-L and cut off rebar and steel tiedown cables. At 0930 hours, the crew moved to H-06-L and cut off the last of the steel fence posts and picked up some cans and other trash. At 1045 the crew moved to PSN 04 and cut off several pieces of steel cable and picked up bricks and wooden construction debris left after the excavation of the anomalies in the onsite landfills. At 1320 hours Ken took the dump truck to the CLF and the crew continued to stockpile trash at PSN 04. Crew left site at 1515 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: September 15, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 15, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, & Tina Westermeyer (E.P. Johnson); Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck w/trailer, Kubota KX 101 Trackhoe, Chevrolet ¾-ton pickup w/trailer, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (H-12-R) at 0700 hours September 15, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Mark Edden, Tina Westermeyer, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. The crew loaded the dump truck with auto parts, commo wire, fence posts, and fence wire. Metal roofing material was loaded into the E.P. Johnson pickup to be recycled off post. Several small pieces of concrete were buried at the site using the Kubota trackhoe. The crew also spent time covering up tracks using a rake. Mark and Bill moved on to H-12-L and cut off rebar and steel tiedown cables. At 0930 hours, the crew moved to H-06-L and cut off the last of the steel fence posts and picked up some cans and other trash. At 1045 the crew moved to PSN 04 and cut off several pieces of steel cable and picked up bricks and wooden construction debris left after the excavation of the anomalies in the onsite landfills. At 1320 hours Ken took the dump truck to the CLF and the crew continued to stockpile trash at PSN 04. Crew left site at 1515 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: September 15, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 19, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, Tina Westermeyer, & Dale Cadieu (E.P. Johnson); Paul Ching, Bill Jennings, & Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck w/trailer, Kubota KX 101 Trackhoe, Chevrolet ¾-ton pickup, Kawasaki Mule 2510 ATV,& Dodge ½-ton pickup w/trailer.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 72/82) at 0630 hours September 19, 1994. Paul Ching and Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Mark Edden, Klint Johnson, Ken Linck, Tina Westermeyer, and Dale Cadieu of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. At 0645, the dump truck moved to PSN 04 where materials had been stockpiled on September 15, 1994 and it was loaded with auto parts commo wire, fence posts, and fence wire. The crew cut off two steel tie downs and collected all transite siding at the Bridge View site and along the road between PSN 72/82 and PSN 80. The crew moved to PSN 80 and collected trash. Dump truck returned at 0945 and hauled a second load to the CLF at 1100 hours. The E.P. Johnson crew continued to stockpile trash at PSN 80. Contractor left site at 1530 hours.

Field Analysis Performed: (Instrument checks. Calibration)
None.

Daily QA Report

Date: September 19, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 20, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, & Tina Westermeyer (E.P. Johnson); Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck w/trailer, Kubota KX 101 Trackhoe, Chevrolet ¾-ton pickup, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup w/trailer.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 80) at 0700 hours September 20, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Mark Edden, Tina Westermeyer, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. At 0715, the dump truck was loaded with auto parts, commo wire, fence posts, and fence wire and departed PSN 80. The crew moved to H-83-C and filled in the old cistern, hauled out a large pile of wooden construction material, and cut off two steel tie downs. The crew moved to PSN 90 and cut off two 4" steel pipes.. Dump truck returned at 0930 and mobilized the trackhoe to PSN 12/14. E.P. Johnson personnel continued to stockpile trash (metal cans, wire, and some sheets of metal siding) at PSN 12/14. Crew left site at 1330 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Daily QA Report

Date: September 20, 1994

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)
All items outside the scope of this task order were stockpiled on a port-a-pad at PSN 12/14 and a sheet of visqueen at PSN 80.

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 21, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny.

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, & Tina Westermeyer (E.P. Johnson); Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup w/trailer.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 80) at 0700 hours September 21, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Mark Edden, Tina Westermeyer, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. E.P. Johnson personnel continued to stockpile trash (metal cans, wire, and some sheets of metal siding) at PSN 12/14. Crew left site at 1330 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: September 21, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

Daily QA Report

Date: September 22, 1994

Project Name: Hanford North Slope Cleanup, Phase 2 Project Number: V-0307-01

Project Location: Hanford North Slope Sites

Field Engineer: George R. Gardner, Shannon & Wilson, Inc.

Weather Conditions:
85 °F, wind 8 knots out of the West, sunny

Observations/Comments:
Personnel on Site: William Zimmerman, Klint Johnson, Mark Edden, Ken Linck, Dale Kadieu, & Tina Westermeyer (E.P. Johnson); Claude Huckins (Corps)

Equipment on Site: IH S1900 Dump Truck, Chevrolet ¾-ton pickup, Kawasaki Mule 2510 ATV, & Dodge ½-ton pickup w/trailer.

SAMPLES COLLECTED

Sample Number	Sample Location	Type	Comment
NONE			

Work Performed:
Field Engineer arrived on site (PSN 12/14) at 0700 hours September 22, 1994. Claude Huckins from Hanford Resident Office of the Walla Walla District and Bill Zimmerman, Klint Johnson, Mark Edden, Tina Westermeyer, and Ken Linck of E.P. Johnson were on site. A safety meeting had been held and the work scheduled for the day had been discussed at 0630 hours. During the safety meeting the Site Health and Safety Plan was reviewed and field log was signed. E.P. Johnson personnel completed stockpiling trash (metal cans, wire, and some sheets of metal siding) at PSN 12/14. All material was hauled to DOE CLF. Wooden building material was stockpiled on site for future action. Crew left site at 1330 hours.

Field Analysis Performed: (Instrument checks, Calibration)
None.

Problems Encountered/Corrective Actions: (Specify Sampling Problems, Alternative Methods Used and any Deviation From Planned Activities)

Daily QA Report

Date: September 22, 1994

Quality Control Activities Conducted:

Levels of Personnel Protection Used During Field Work:
Field engineer and workers were in Level D for all trash removal.

George R. Gardner
Senior Environmental Engineer

APPENDIX C

PHOTOS

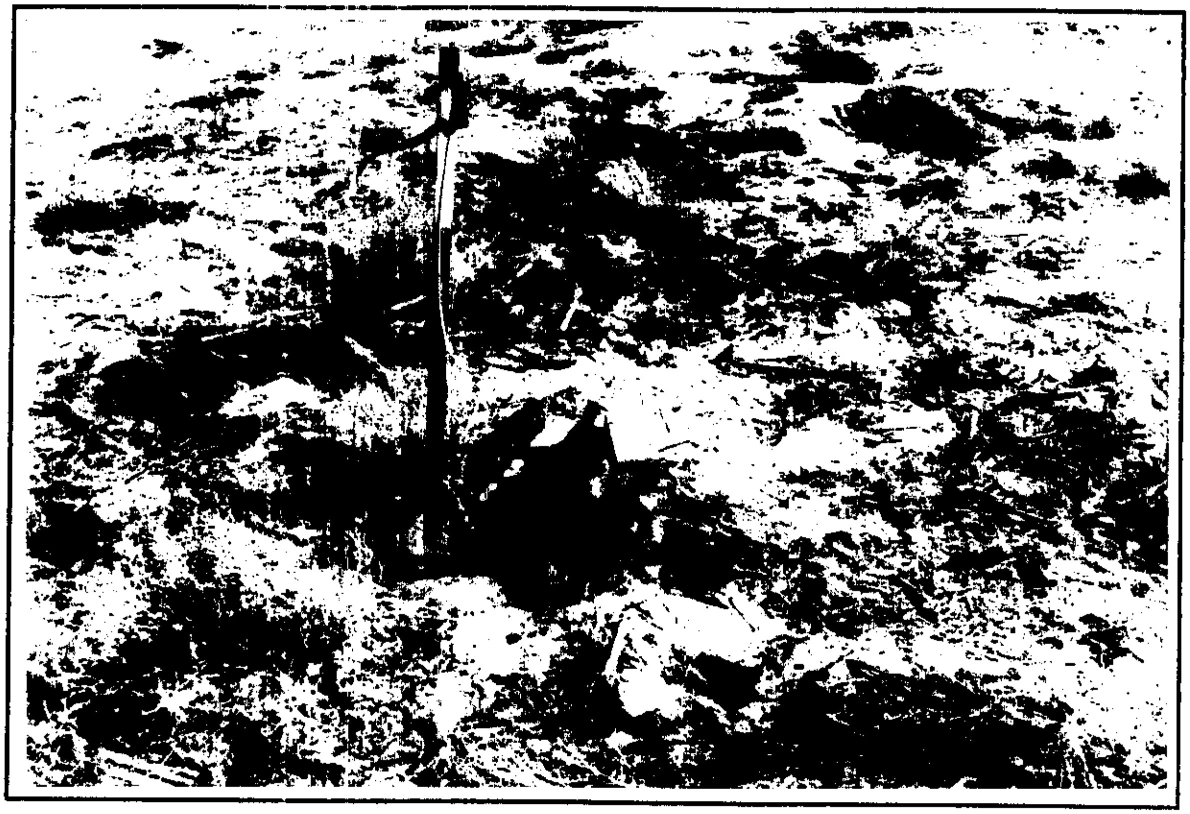


Photo 1. Bridge View Site. Paint can discovered and marked.

Photo 2. Bridge View Site. Oil cans discovered and marked

Photo 3. PSN 72/82 Site. Paint cans discovered and marked

Photo 4. PSN 72/82 Site. Oil cans discovered and marked.

Photo 5. H-81-R Site. Wooden construction material originally left for burning. Under Phase 2, was hauled to Hanford CLF.

Photo 6. H-81-R Site. Second pile of wooden construction material hauled to Hanford CLF under Phase 2.

Photo 7. H-81-R Site. Debris pile from Phase 1 hauled to Hanford CLF during Phase 2.

Photo 8. H-83-C Site. Cistern backfilled and raked out.

Photo 9. H-83-C Site. Wooden debris removed September 19, 1994.

Photo 10. H-83-C Site. More wooden debris found and removed.

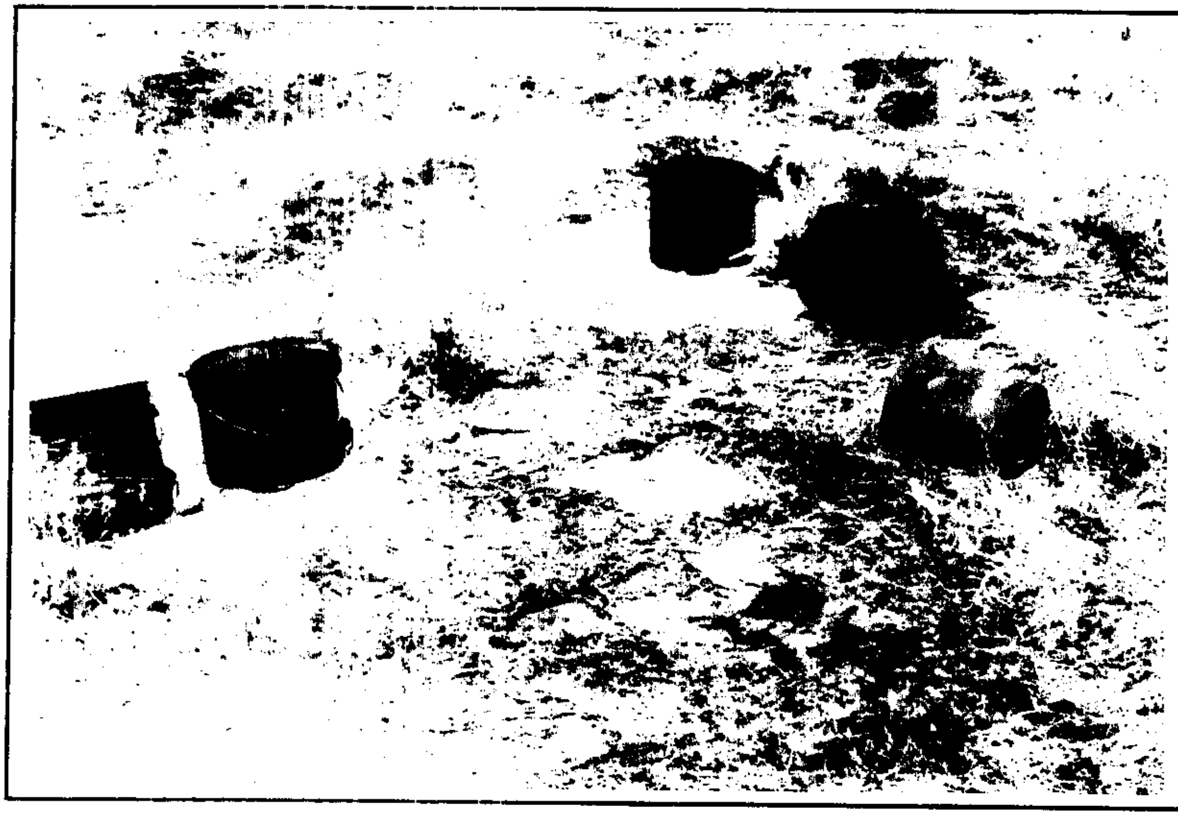


Photo 11 PSN 80 Site. Grease cans discovered and removed.

Photo 12. PSN 80 Site. Oil and solvent cans

Photo 13. PSN 80 Site. Treated railroad ties, partially burned.

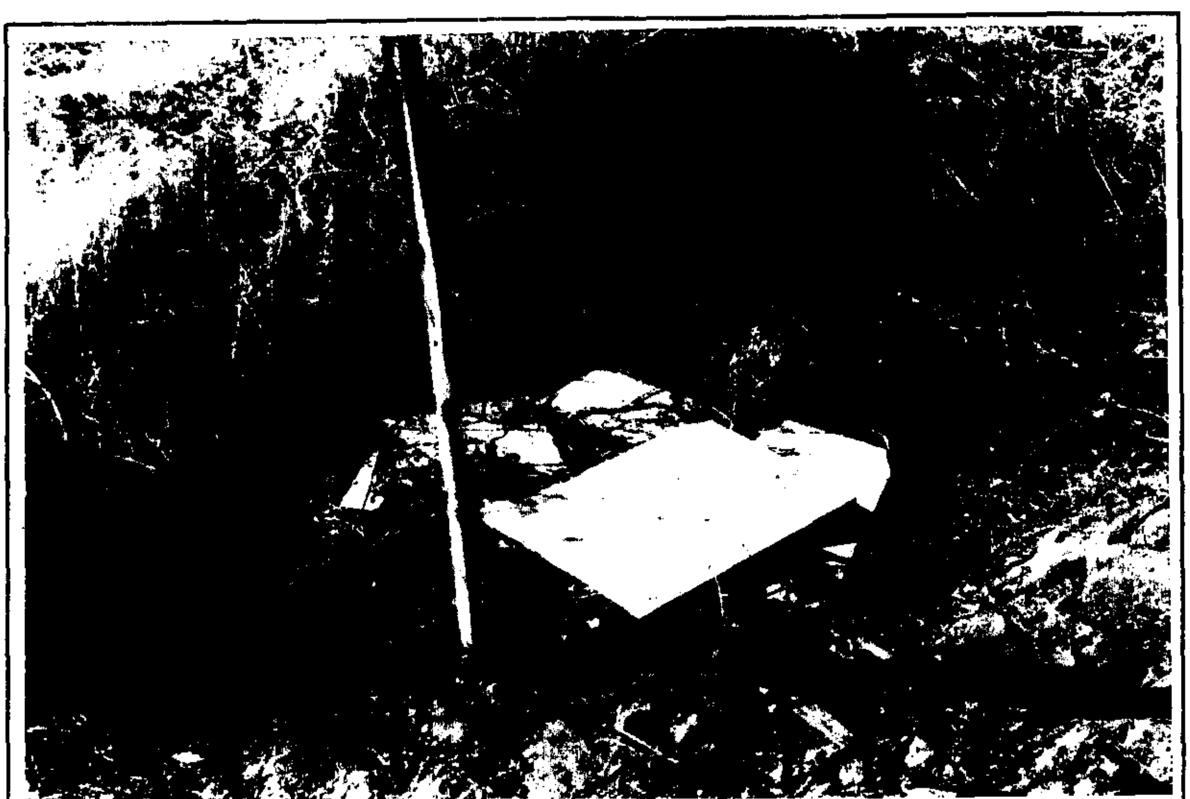


Photo 14. PSN 80 Site. Transite siding.

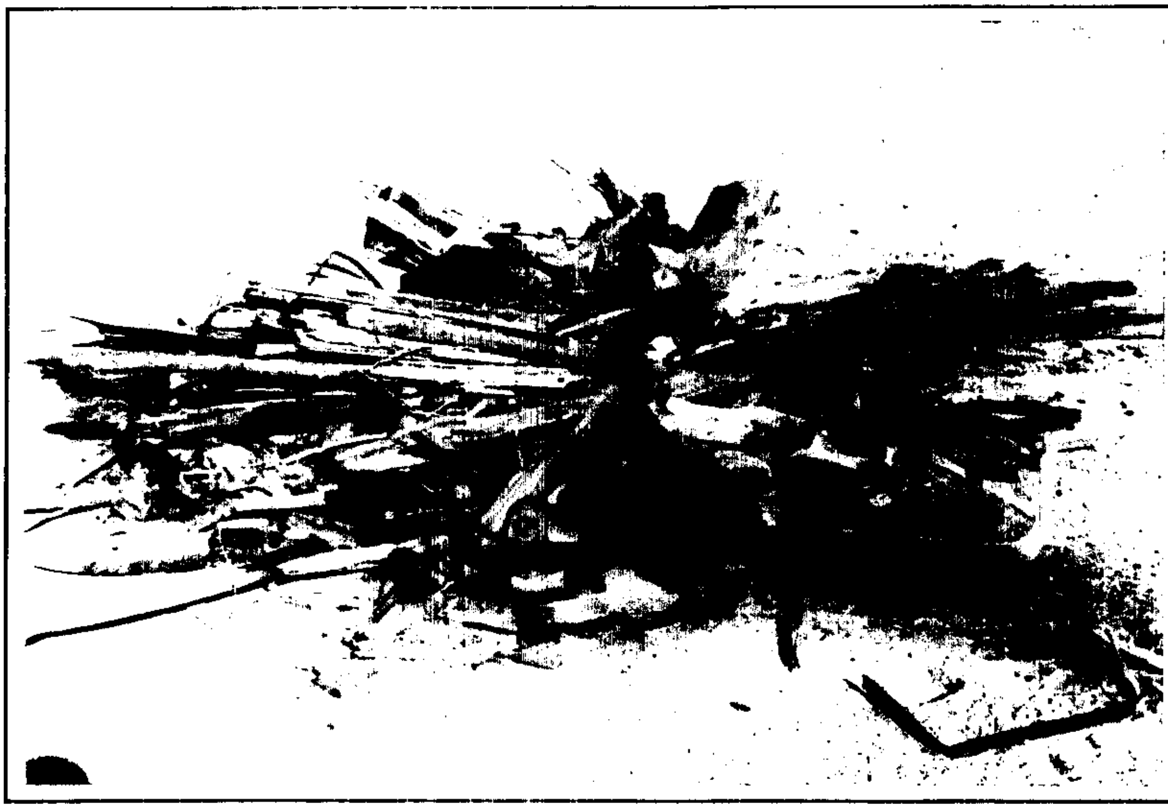


Photo 15. PSN 80 Site. Trash including solvent and oil cans, banding material and wooden construction material stockpiled for hauling to Hanford CLF.

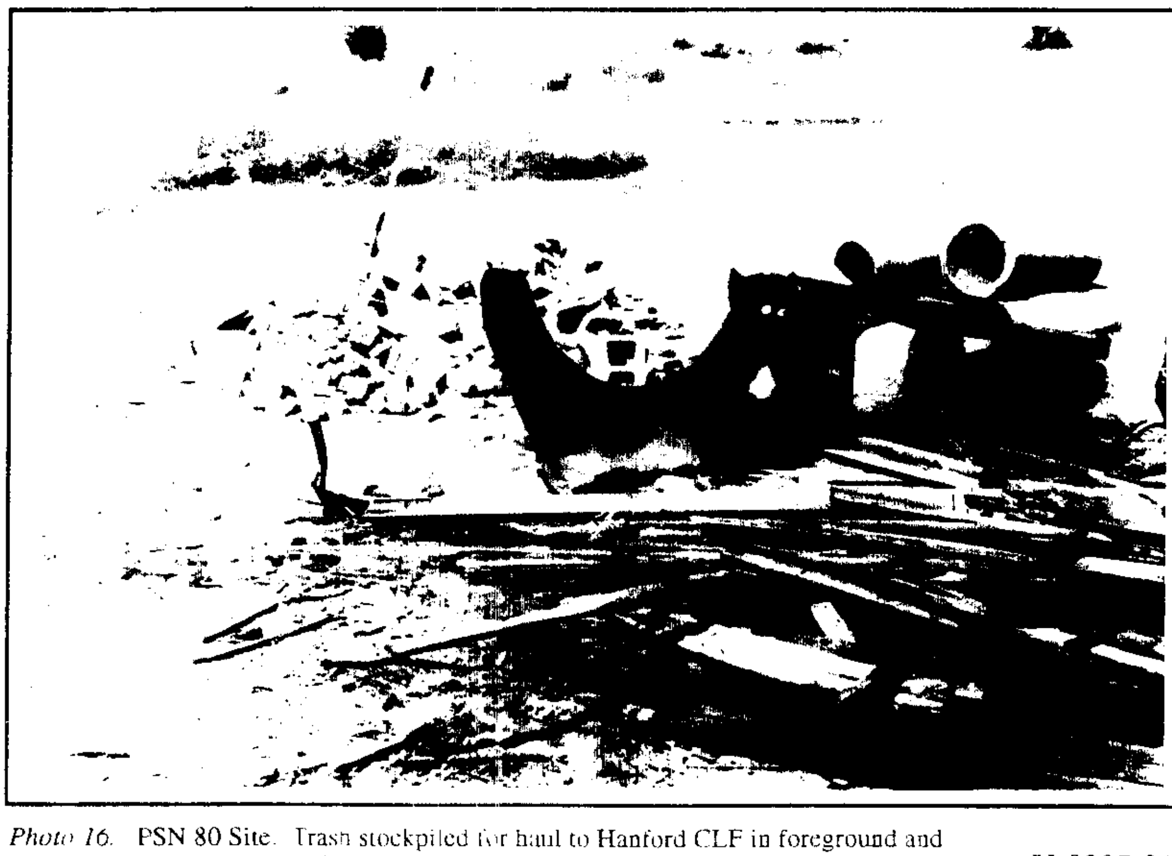


Photo 16. PSN 80 Site. Trash stockpiled for haul to Hanford CLF in foreground and concrete hauled to Hanford Concrete Recycling Facility in background.

Photo 17. PSN 80 Site. Immersion heater fuel tank.

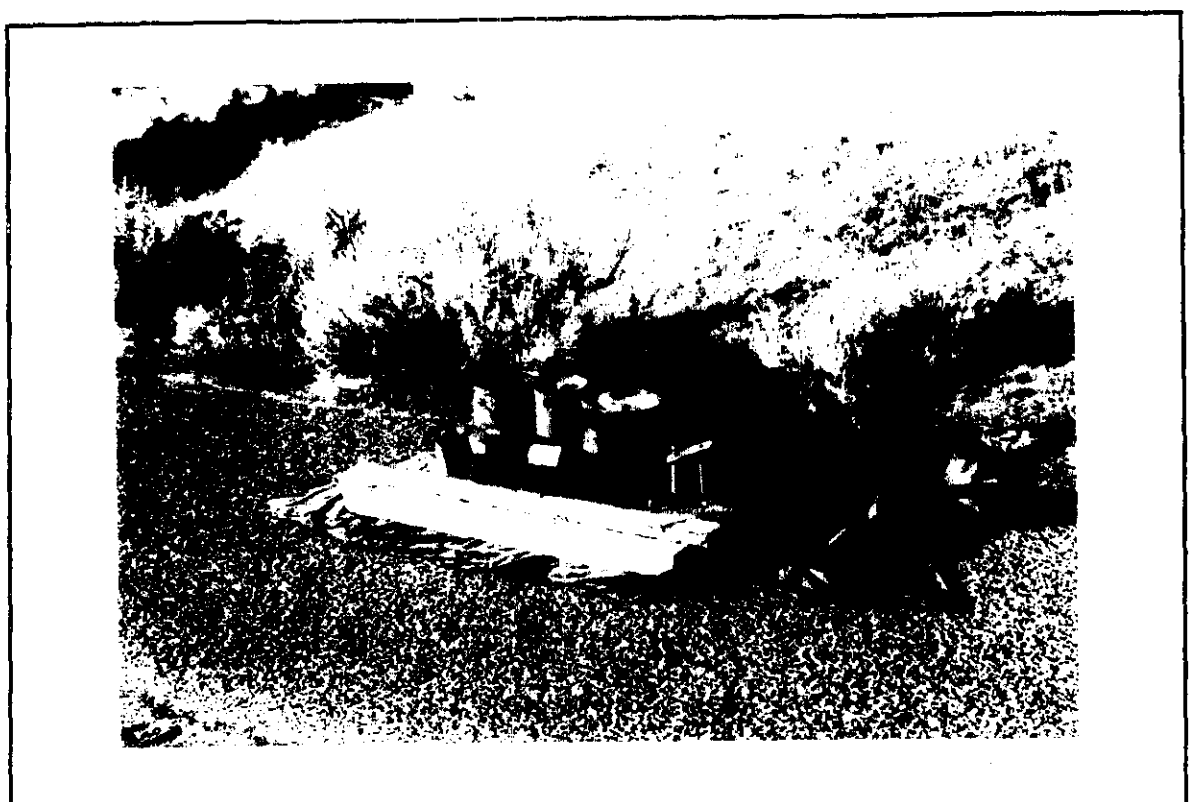


Photo 18. PSN 80 Site. Cans, batteries, and treated timbers stockpiled.

Photo 19. WSDOT Pit 47 Site. Wooden debris removed from second pit.

Photo 20. WSDOT Pit 47 Site. Cans and banding material buried in hole in second pit.

Photo 21. WSDOT Pit 47 Site. Oil filter discovered and marked.

Photo 22. WSDOT Pit 47 Site. Oil filters discovered and marked.

Photo 23. PSN 90 Site. Concrete debris pile.

Photo 24. PSN 90 Site. Concrete debris removed and site graded.

Photo 25. PSN 90 Site. Metal siding dug out of mounds on site.

Photo 26. PSN 90 Site. Aluminum beams found and removed.

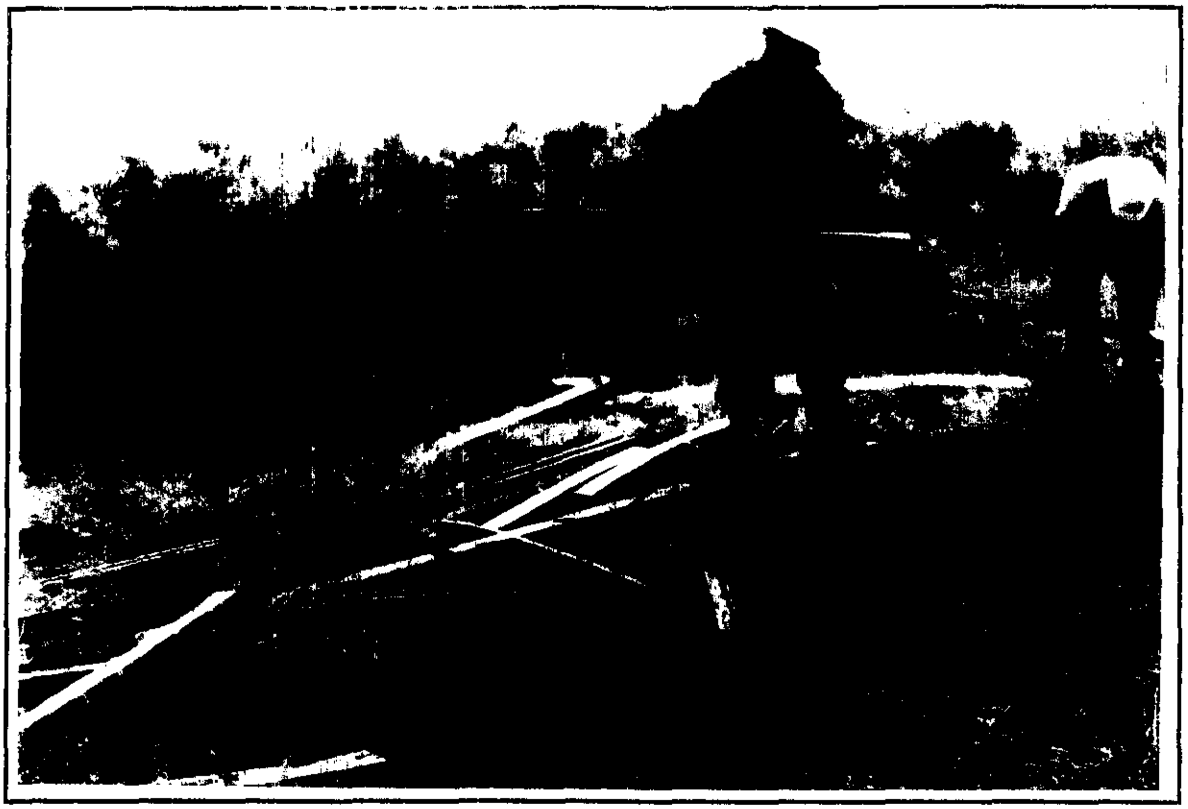


Photo 27. PSN 90 Site. Aluminum I-beams and wooden construction material removed from site.

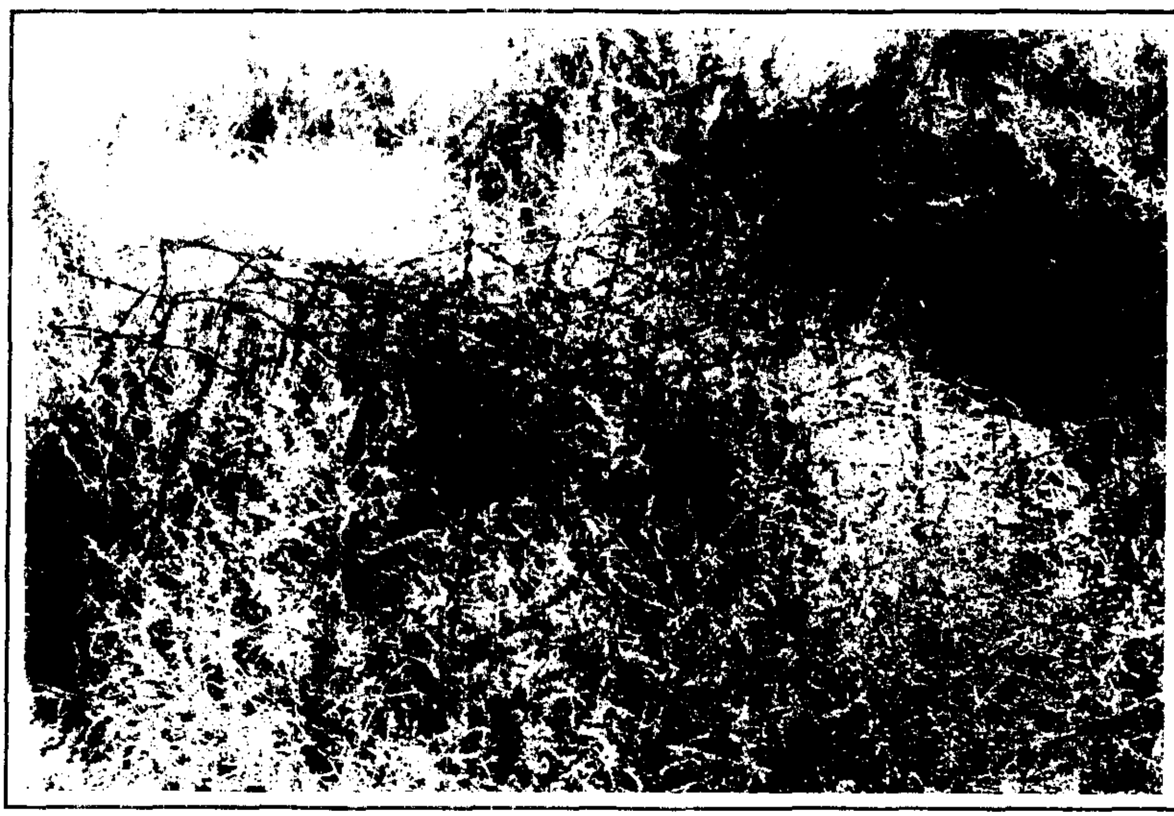


Photo 28. PSN 90 Site. Wire mesh cage removed from site

Photo 45. PSN 12/14 Site. Paint can and construction material discovered near military dump.

Photo 46. PSN 12/14 Site. Paint cans found near motor pool site.

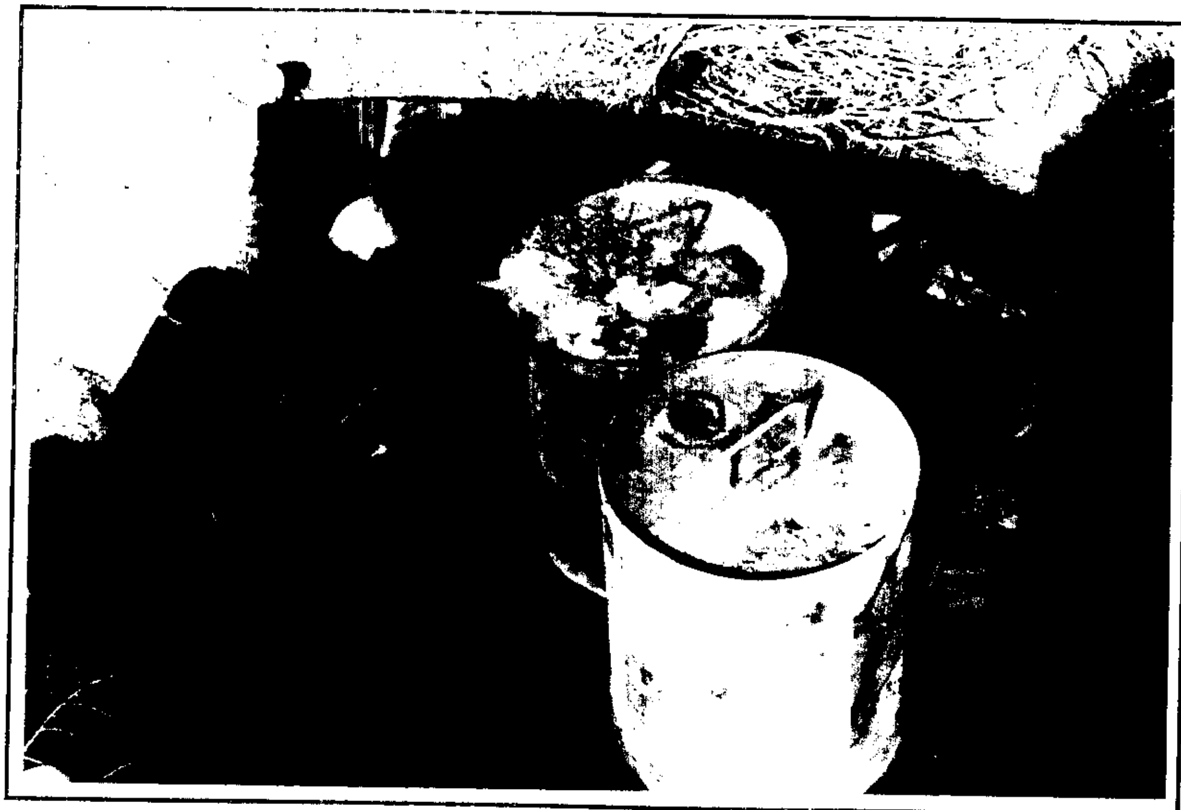


Photo 29. Pit 56 Site. Oil cans with residue.

Photo 30. Pit 56 Site. Oil can full of dead bugs.

Photo 33. PSN 04 Site. Oil barrel and banding material found on road to H-06-C.

Photo 34. PSN 04 Site. Potentially hazardous materials stockpiled on visqueen.

Photo 31. Pit 56 Site. Treated timber and other wooden debris removed from site.

Photo 32. PSN 04 Site. Auto battery discovered on site.

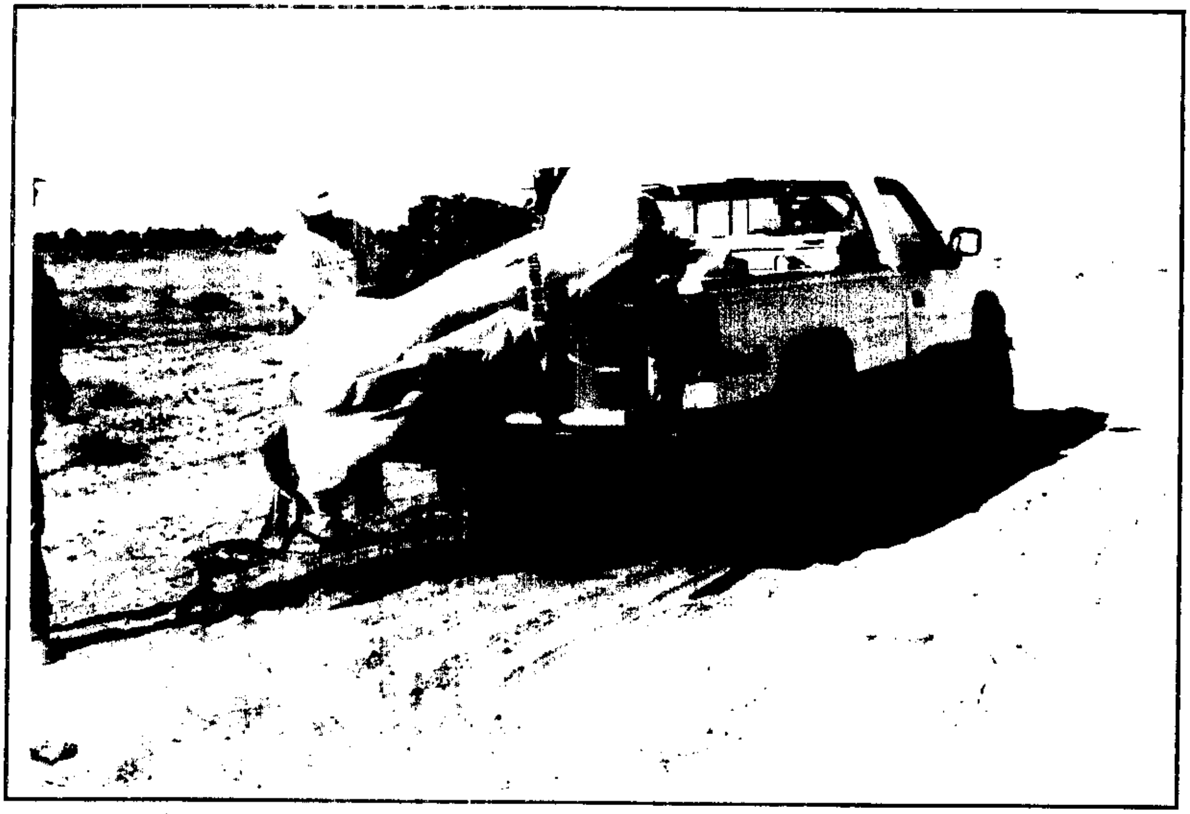


Photo 35. PSN 07/10 Site. Cleanup of visqueen after removal of TPH contaminated soil by ICF Kaiser Hanford Company.

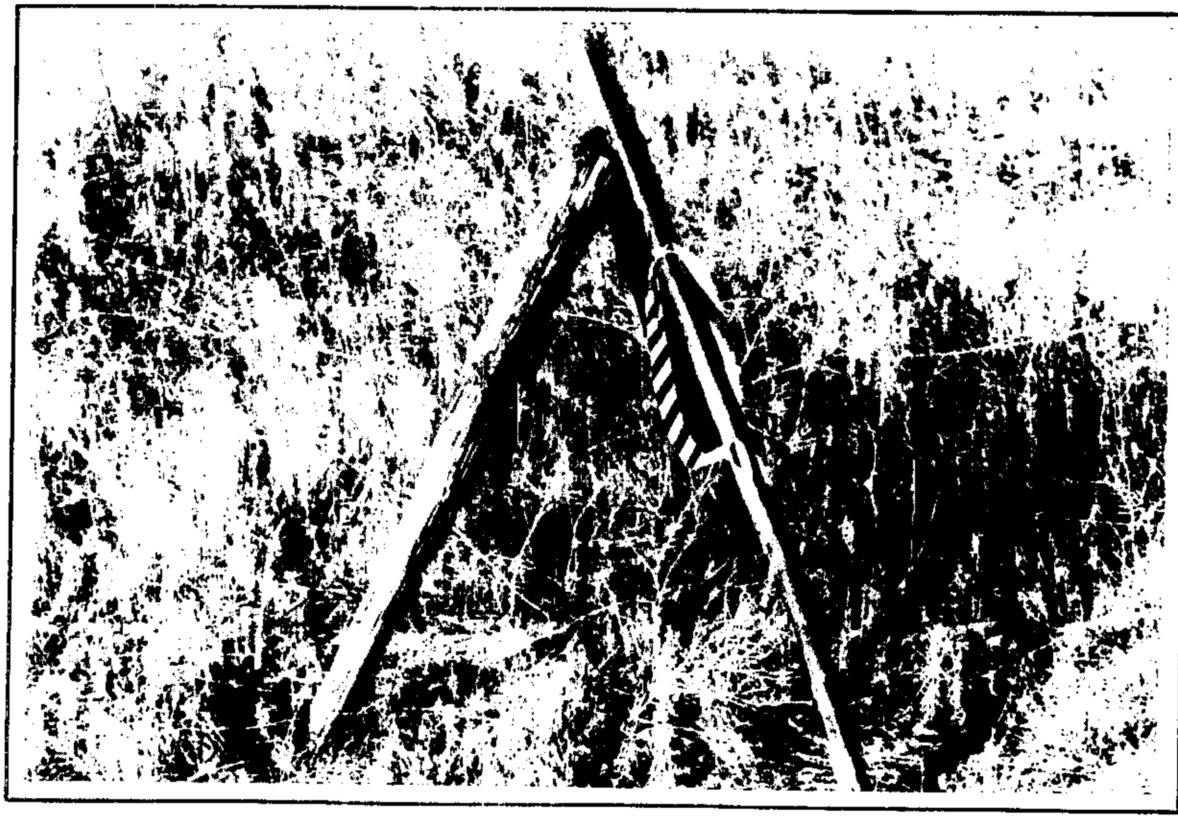


Photo 36. PSN 07/10 Site. Wooden debris.

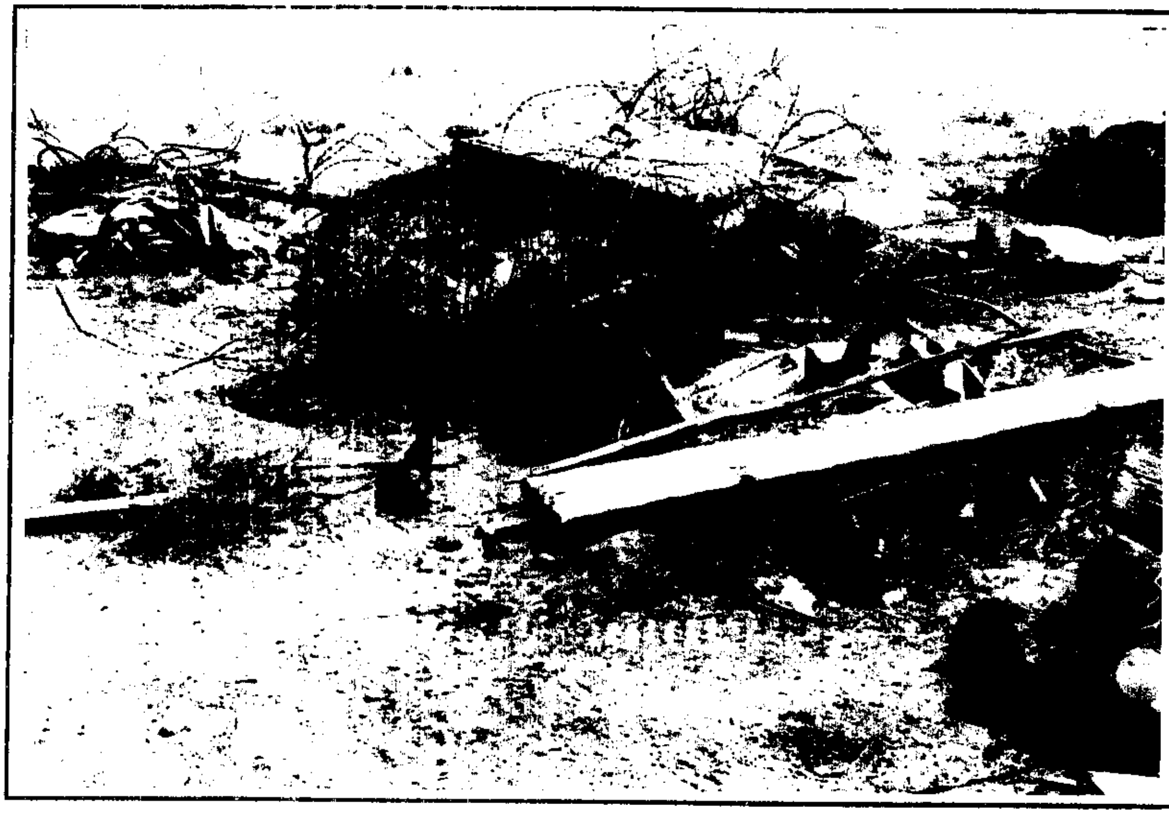


Photo 37. PSN 07/10 Site. Debris stockpiled prior to being hauled to Hanford CLF.

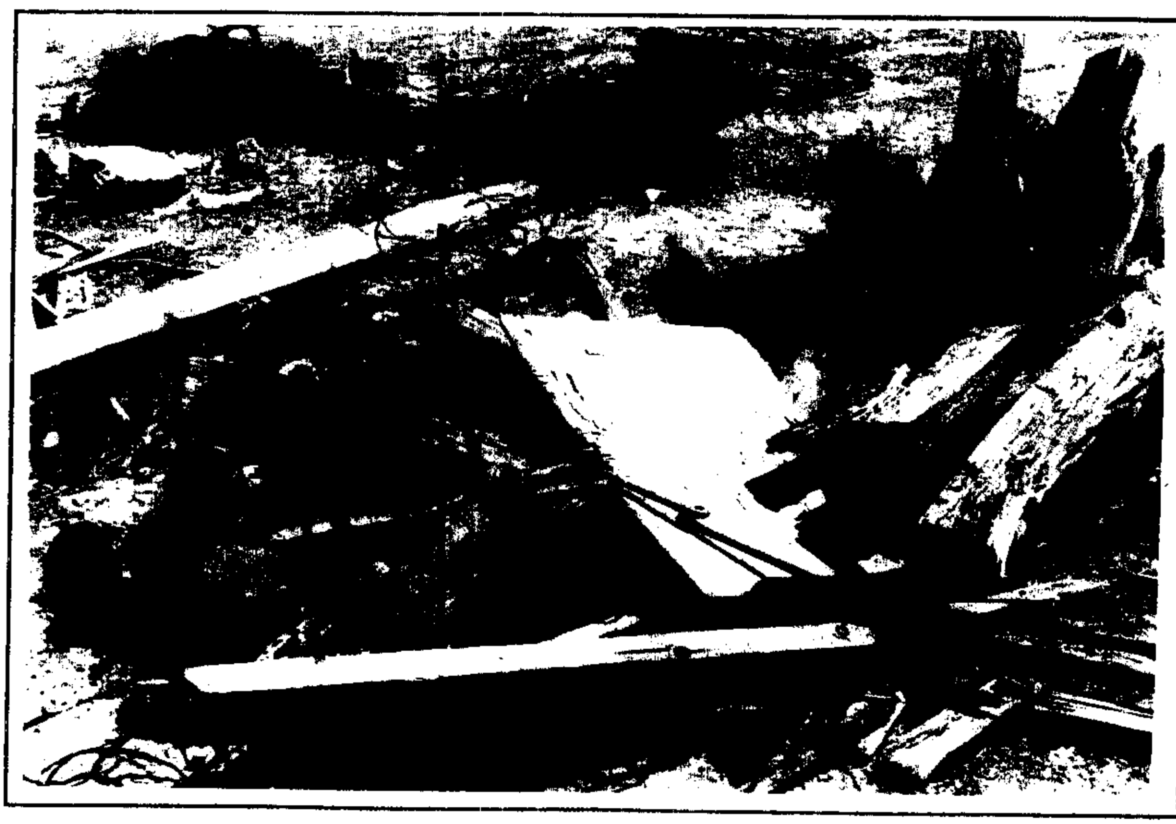


Photo 38. PSN 07/10 Site. Debris stockpiled prior to being hauled to Hanford CLF.

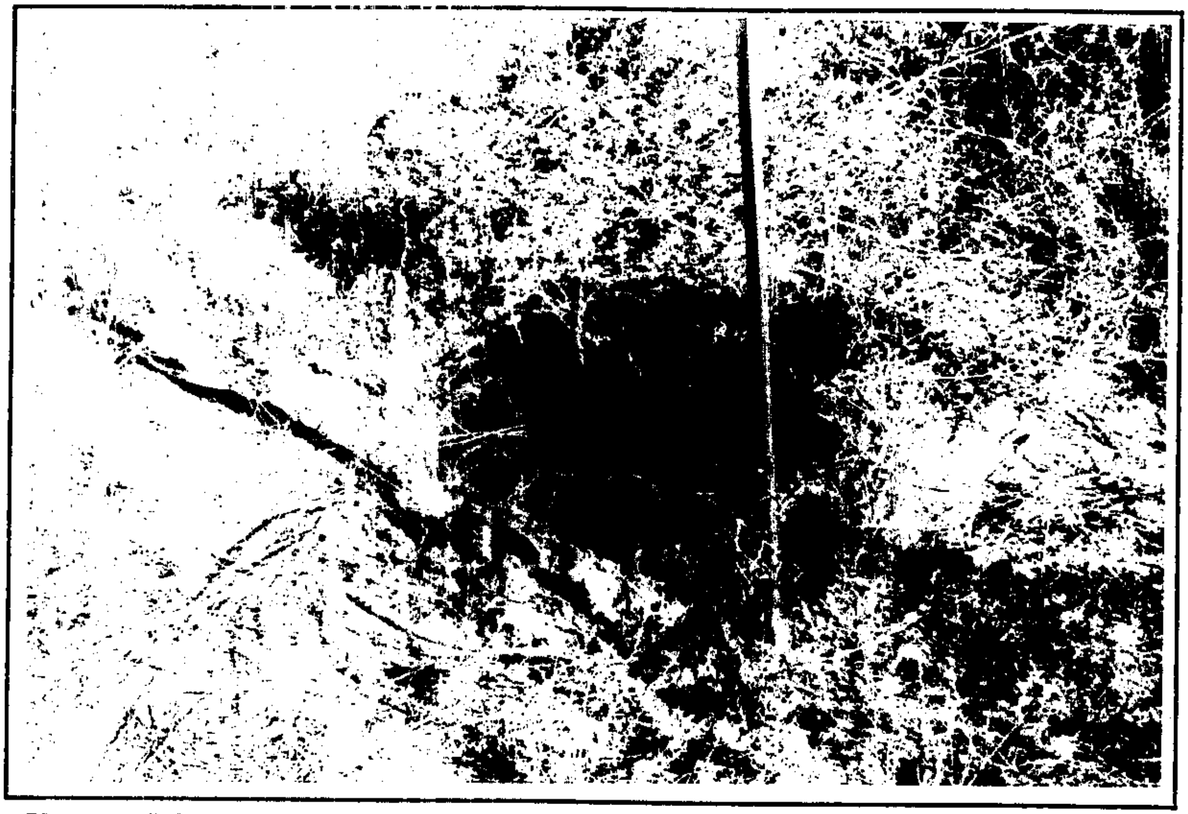


Photo 39. H-06-L Site. Barrel discovered and buried on site.

Photo 40 H-06-L Site Concrete pad after all rebar has been cut off

Photo 41. Stock Tank and Well Cistern Site. Cistern being backfilled using tractor backhoe.

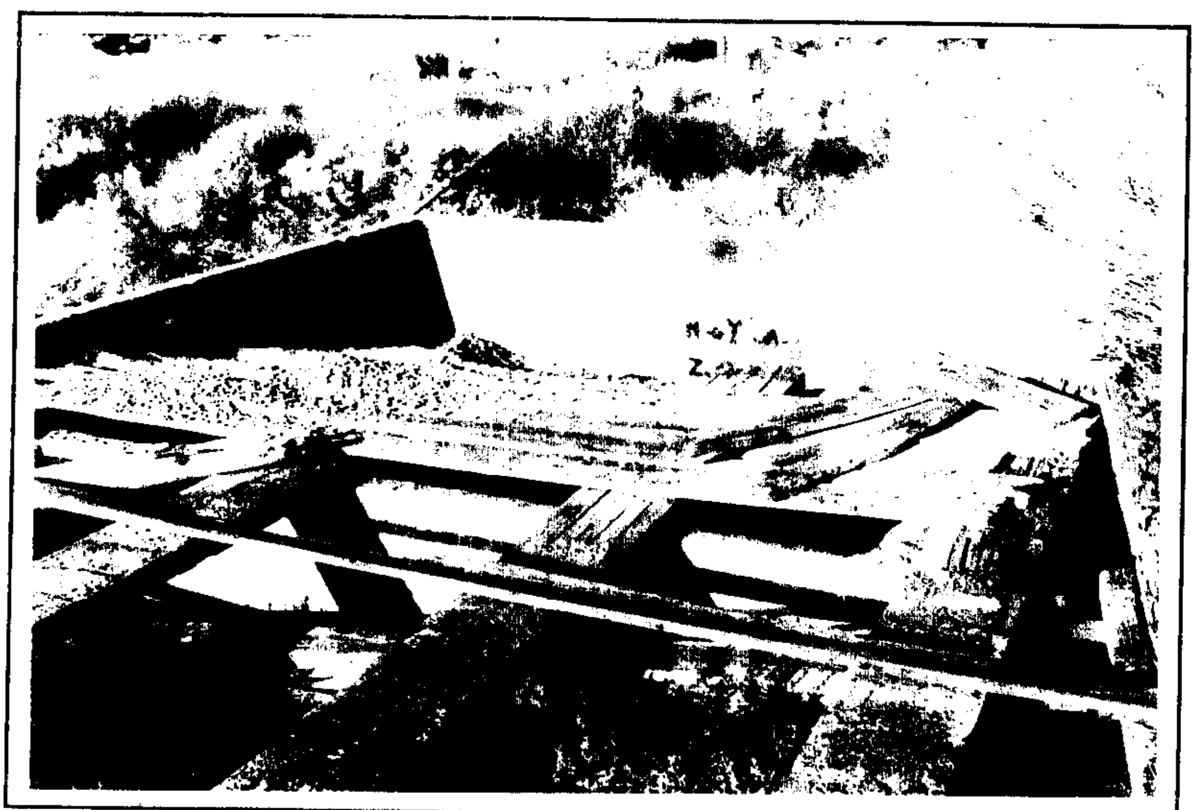


Photo 42. Stock Tank and Well Cistern Site. Cistern cover

Photo 43. PSN 12/14 Site. Paint cans and timbers picked up at site.

Photo 44. PSN 12/14 Site. Tire and construction material found on site.

Photo 45. PSN 12/14 Site. Paint can and construction material discovered near military dump.

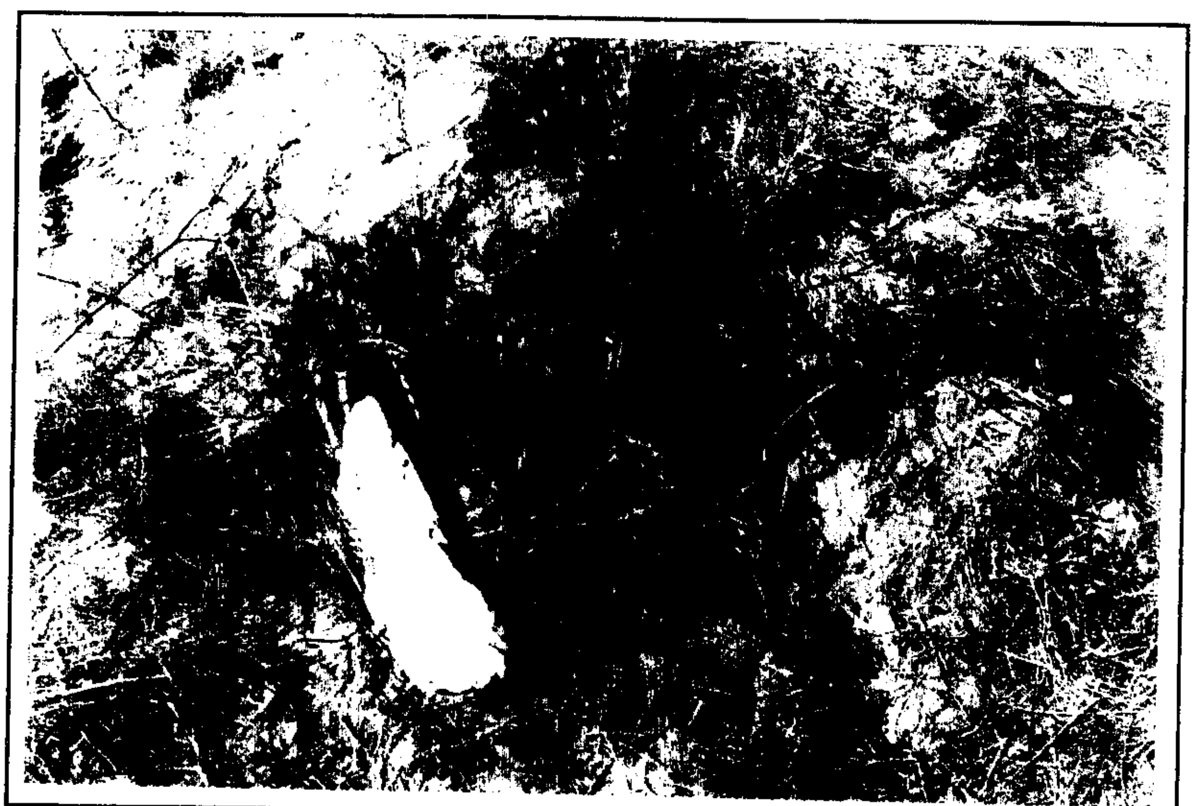


Photo 46. PSN 12/14 Site. Paint cans found near motor pool site.

Photo 47. PSN 12/14 Site. Paint cans and timbers. Cans were added to stockpile of potentially hazardous material.

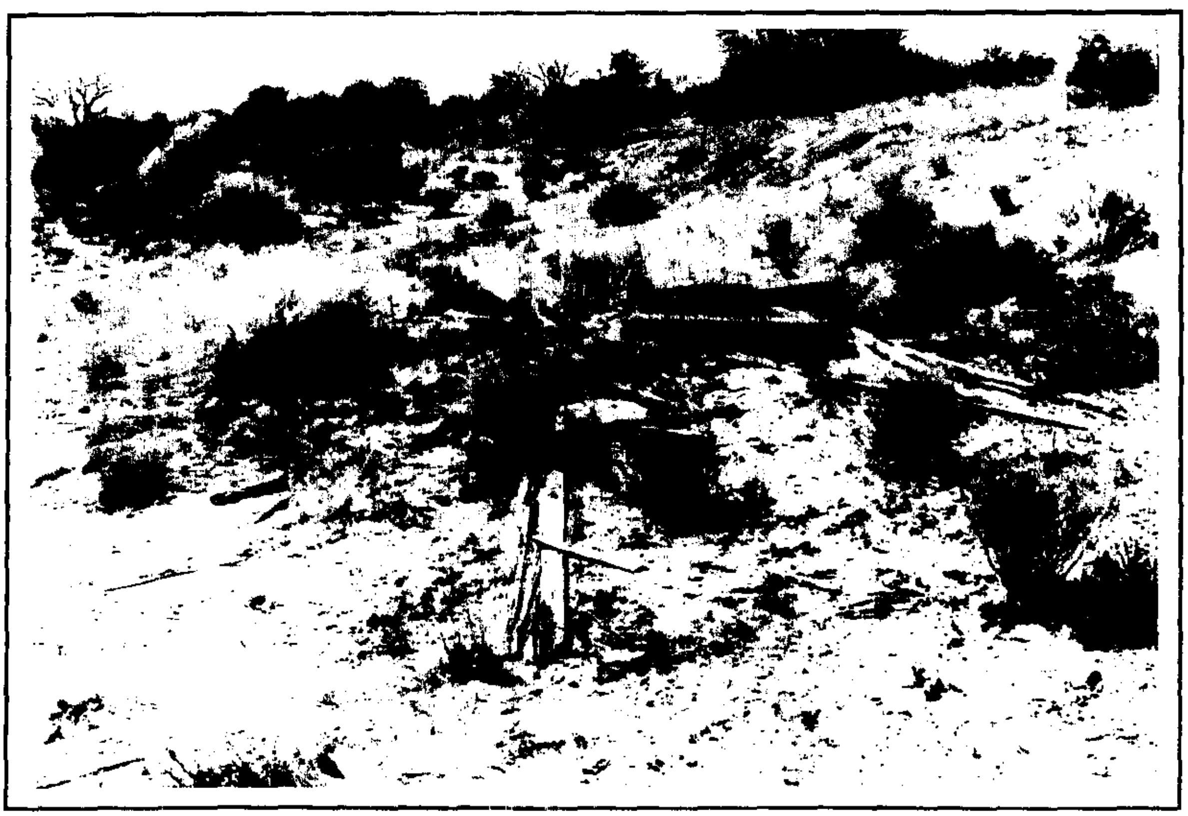


Photo 48. PSN 12/14 Site. Wooden construction material found in sand pit north of site.

Photo 49. PSN 12/14 Site. Transite siding found in sand pit north of site.

Photo 50. PSN 12/14 Site. Tin cans found in large dump site north of site.

Photo 51. PSN 12/14 Site. Wooden construction debris found in large dump site north of site.

Photo 52. PSN 12/14 Site. Wooden construction debris, metal siding, and oil can found at large dump site.

Photo 53. PSN 12/14 Site. Metal siding stockpiled at large dump site.

Photo 54. PSN 12/14 Site Wooden barn door at dump site north of PSN

Photo 55. H-12-R Site. Debris pile.

Photo 56. H-12-R Site. Site after debris was removed.

APPENDIX D

IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL SITE ASSESSMENT REPORT

SHANNON & WILSON, INC
Geotechnical and Environmental Consultants

Dated: October 12, 1994

To: Walla Walla District

Attn: Mr. Randy Chong

Important Information About Your Environmental Site Evaluation/Assessment Report

ENVIRONMENTAL EVALUATIONS/ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND ENTITIES.

This report was prepared to meet the specific needs of a specific site(s). Unless indicated otherwise, we prepared your report expressly for you and for the purposes you indicated. No one other than you should apply this report for its intended purposes without first conferring with us. No party should apply this report for any purpose other than that originally contemplated without first conferring with the engineer/geoscientist.

The findings and conclusions documented in this site evaluation/assessment have been prepared for specific application to this project and have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in this area. The conclusions presented are based on interpretation of information currently available to us and are made within the operational scope, budget, and schedule constraints of this project. No warranty, expressed or implied, is made.

(REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

Our environmental site assessment/evaluation is based on, but not limited to, several factors: reviewing public documents to chronicle site ownership for the past 30, 40, or more years; investigating the site's regulatory history to learn about permits granted or citations issued; determining prior uses of the site and those adjacent to it; reviewing available topographic and real estate maps, historic aerial photos, geologic information, and hydrologic data; reviewing readily available published information about surface and subsurface conditions; evaluating the potential for naturally occurring hazards; and interviewing public officials with respect to local concerns.

Except as noted within the text of the report, no quantitative laboratory testing was performed as part of the site assessment. Where such analyses were conducted by an outside laboratory, Shannon & Wilson relied upon the data provided and did not conduct an independent evaluation regarding the reliability of the data.

CONDITIONS CAN CHANGE.

Site conditions, both surface and subsurface, may be affected as a result of natural changes or human influence. An environmental site assessment/evaluation is based on conditions that existed at the time of the evaluation. Because so many aspects of a historical review rely on third party information, most consulting engineers will refuse to certify (warrant) that a site is free of contaminants, as it is impossible to know if such a condition exists. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas that showed no signs of contamination when previously studied.

Unless our engineer/scientist indicates otherwise, your report should not be used when: 1) the size or configuration of the site is altered; 2) when the location of the site is modified; 3) when there is a change of ownership and/or use of the property; 4) for en nental subsurface conditions at an adjacent site; 5) for construction at an adjacent site or on site; or 6) in the event of floo , earthquakes, or other acts of God.

READ RESPONSIBILITY CLAUSES CAREFULLY.

Because environmental site assessments/evaluations are based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical/environmental consultants. To help prevent this problem, geotechnical/civil engineers and/or scientists have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the engineer's or scientist's liabilities to other parties; rather, they are definitive clauses that identify where responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses may appear in this report, and you are encouraged to read them closely. Your engineer/scientist will be pleased to give full and frank answers to your questions.

Consulting engineers/scientists cannot accept responsibility for problems that may develop if they are not consulted after factors considered in their reports have changed. Therefore, it is incumbent upon you to notify your engineer/scientist of any factors that may have changed prior to submission of our final assessment/evaluation.

An assessment/evaluation of a site helps reduce your risk, but does not eliminate it. Even the most rigorous professional assessment may fail to identify all existing conditions.

ONE OF THE OBLIGATIONS OF YOUR CONSULTING ENGINEER/SCIENTIST IS TO PROTECT THE SAFETY, HEALTH, PROPERTY, AND WELFARE OF THE PUBLIC.

If our environmental site assessment/evaluation discloses the existence of conditions that may endanger the safety, health, property, or welfare of the public, we may be obligated (under rules of professional conduct, statutory law, or common law) to notify you and others of these conditions.

SECTION 4

NORTH SLOPE WELL
DECOMMISSIONING REPORT

1.0 GENERAL

Fiscal year 1994 Well Decommissioning completed/evaluated all wells required to fulfill the Hanford Federal Facility Agreement and Concent Order (Tri-Party Agreement) interim milestones. The milestone, M-16-82 (North Slope) was fulfilled when field work was completed October 14, 1994.

A total of eleven wells were decommissioned supporting the North Slope decommissioning project. Several of the wells on the decommissioning list were either utilized or could not be located and assumed decommissioned. Well 699-107-79 (PSN-90 #2) is a water supply well. The South Columbia Basin Irrigation District (SCBID) is utilizing this well. Wells 699-76-90, 699-98-54A, and 699-108-20 were unable to locate, these wells are assumed decommissioned. Well 699-86-64 was determined to be adjacent to the 100 N reactor, South of the Columbia River.

North Slope wells decommissioned included 699-115-7 (DH-4), 699-79-104, 699-61-16A (Foster Ranch), 699-61-16B (Foster Ranch), 699-51-7, 699-70-17, 699-86-95, 699-93-93, 699-92-14, 699-111-24, 699-112-37, and 699-115-61.

1.1 Army Water Supply Wells

A listing of wells designated as Army water supply wells are listed as follows:

699-111-24 (PSN 500-1); 699-86-95 (PSN H83C); 699-92-14 (PSN 505 #9); 699-112-37 (PSN 535 #8); 699-115-61 (PSN 420 #7); and 699-93-93 (PSN H83L). Note: Wells 699-112-37, 699-115-61, and 699-93-93 contained oil products. These wells/constituents will be discussed further in Section 2.0.

1.2 Other Water Supply Wells

A listing of wells designated as water supply wells are listed as follows:

699-61-16A (Foster); 699-61-16B (Foster); and 699-51-7.

1.3 Monitoring Well

Well 699-70-17 (DH-19) was used as a characterization/monitoring well and was decommissioned as part of the North Slope decommissioning project.

2.0 CONTAMINATED WELL DECOMMISSIONING

During North Slope well decommissioning Army water supply wells were determined to contain items/constituents not normally found in wells. The Army wells are located near highway 24 and have public access with the exception of the 699-93-93 well, which is behind a locked gate. Various items, e.g., cans, steel, aluminum, rocks, railroad ties, syringes, steel cable, oil filters, were discovered in and around these wells. Even a tree was stuffed into a well. Most items were drillable/removeable, but on occasion the final few feet created a problem and could not be drilled out.

The North Slope well decommissioning had three (3) wells that contained hydrocarbon constituents. The method of decommissioning these wells are discussed in Sections 1.2.3.1 through 1.2.3.3.

2.1 Well 699-93-93

A summary of events relative to well 699-93-93 is listed as follows:

o Camera log is ran and a constituent is found floating on the water. A bone(s) is also located in the well during the camera survey;

o A sample is obtained from the well and analyzed. The constituent is determined to be halogenated hydrocarbons, which is considered as persistent waste;

o The analysis was reviewed by safety and the appropriate documentation was prepared to remove the waste from the well, which was conducted using an electric submersible pump and bailer;

o A second camera ran was conducted to evaluate the bone. The bone(s) could not be located. However, a Pacific NorthWest Biologist reviewed the first tape and believed it to be a bone of a small mammal, which in fact makes good sense comparing the size of the bone with the camera lense. Also, numerous mice were removed from the well prior to taking water samples.

o A water sample was obtained to determine status of the well after waste removal. The analysis indicated that the water remaining in the well was clean;

o Decommissioning activities were completed.

2.2 Well 699-112-37

A summary of events relative to well 699-112-37 is listed as follows:

o Well decommissioning was underway at a depth of 81 m (265 ft) when the plug broke loose and was pushed downward. Rods were ran in the well to 117 m (385 ft). Air was circulated through the drill string to verify circulation. An oil product was noticed at the circulation tank. Work stopped pending evaluation;

o An electronic tape was ran to determine thickness of the oil. Thickness of the oil was determined to be 12.7 cm (5 in) in a 40.6 cm (16 in) casing;

o CAM INDUSTRIES was called to conduct field screening. A Miran 1B, equipped with Spectra/Match, was used to screen for 400 plus compounds. An FTIR instrument was also utilized. It was determined that low volatile straight-chain hydrocarbons, which is consistent with used moter oil, existed;

o Drilling equipment demobilized;

o The analysis was reviewed by safety and the appropriate documentation was prepared to remove the waste from the well, which was conducted using an electric submersible pump and bailer;

o The oil was removed from the well-bore. Oil and water samples were taken for analysis.

The water samples missed holding times due to the shipping firm, therefore samples were taken again;

o Results showed elevated levels of chromium and lead in the waste stream. The water samples came back clean, however water samples were submitted to another laboratory for heavy metals. Results indicated the water to be clean.

o Well decommissioning was completed.

2.3 Well 699-115-61

A summary of events relative to well 699-115-61 is listed as follows:

o Well decommissioning was underway at a depth of 129.2 m (424 ft) when the plug was penetrated. An oil product was noticed at the circulation tank. Work stopped pending evaluation;

o CAM INDUSTRIES was called to conduct field screening. A Miran 1B, equipped with Spectra/Match, was used to screen for 400 plus compounds. An FTIR instrument was also utilized. It was determined that low volatile straight-chain hydrocarbons, which is consistent with used moter oil, existed;

o Drilling equipment demobilized;

o The analysis was reviewed by safety and the appropriate documentation was prepared to remove the waste from the well, which was conducted using an electric submersible pump and bailer;

o The oil was removed from the well-bore. Oil and water samples were taken for analysis.

The water samples missed holding times due to the shipping firm, therefore samples were taken again;

o Results showed elevated levels of arsenic, cadmium, chromium and lead in the waste stream. The water samples came back clean, however water samples were submitted to another laboratory for heavy metals. Results indicated the water to be clean.

o Well decommissioning was completed.

3.0 LOCATIONS OF WELL DECOMMISSIONINGS

Table 1 provides Hanford and State coordinates for North Slope wells.

TABLE 1.

WELL NUMBER	STATE COORDINATES		HANFORD COORDINATES	
699-70-17	N 475,644.24	E 2,277,824.59	N 70,387	W 17,320
699-107-79	N 512,000	E 2,216,200	N 107,000	W 78,890
699-61-16A	N 466,729	E 2,279,494	N 61,467	W 15,673
699-61-16B	N 466,730	E 2,279,500	N 61,450	W 15,700
699-51-7	N 456,284	E 2,288,194	N 51,000	W 7,000
699-115-61	N 519,779	E 2,234,474	N 114,633	W 60,557
699-112-37	N 516,945	E 2,258,469	N 111,737	W 36,569
699-93-93	N 498,000	E 2,202,000	N 93,000	W 93,000
699-111-24	N 516,240	E 2,271,040	N 111,000	W 24,000
699-86-95	N 491,058	E 2,200,105	N 86,000	W 95,000
699-92-14	N 497,266	E 2,281,000	N 92,000	W 14,000

ATTACHMENT 1

WESTINGHOUSE HANFORD COMPANY
GENERATOR & WASTE ACCEPTANCE SERVICES

PREDETERMINATION REPORT

REQUEST # 24500 *DATE:* July 28, 1994

PRODUCT	PREDETERMINATION OF UNKNOWN OIL MATERIAL STILL IN N. SLOPE WELL

TO	Scott M yers	*COMPANY*	WHC
PHONE	376-7619	*ADDRESS*	WNP-TR57
FACILITY	EFSG	*MSIN*	N3-06

ANALYST	K. W. Chang K.W. Chang	*MSIN*	T3-05	*PHONE*	372-0679
REVIEWER	[illegible]	*MSIN*	T3-05	*PHONE*	
cc	File				

Based upon lab. data provided with the request, the oil material in N. Slope is considered to be regulated waste by current Washington Dangerous Waste Regulations (WAC 173-303), with waste code of WP02. (The unknown oil material may contain up to 0.0778% of halogenated hydrocarbons, which is considered as persistent waste.)

For any questions or comments, please contact the Generator & Waste Acceptance Services analyst above and reference the request #. Thank you for your interest in predetermination.

DISCLAIMER

This predetermination is believed accurate based on the information provided. Predeterminations are performed to assist generators in selecting less hazardous products. Since solid waste regulations are subject to constant revision, waste status may change without notice. *Waste designations must be performed on all wastes* by Generator & Waste Acceptance Services to assure proper disposal in the event products are spilled or contained within a waste matrix.

Westinghouse Hanford Company

Internal Memo

From: 222-S Organic Chemistry

Phone: 373-2872 T6-50

Date: June 21, 1994

Subject: ANALYTICAL RESULTS - R5202

8E460-94-006

To: W. V. SETZER N3-05

The following sample was analyzed by gas chromatography/mass spectroscopy. The preparation and analysis was performed using a Test Plan. The objective of the Test Plan was to tentatively identify high concentrations of organic chemical contained in the sample. Tentative compound identification was based on computerized matching of mass spectra with that of spectra contained in the National Bureau of Standards Library and knowledge of mass spectral fragmentation patterns.

Laboratory ID:	R5202	Submitted by:	W. V. Setzer
Customer ID:	9393(B)	Matrix:	Liquid
Laboratory submittal date:		04/29/94	

TENTATIVELY IDENTIFIED COMPOUNDS:

The sample was found to contain a mixture of hydrocarbons. Based on the large envelope and a comparison to other products, it was concluded that the sample contained a heavy oil or petroleum based product of similar type.

If there are any questions regarding this data, please call.

K. B. Wehner,
Manager

sz

WESTINGHOUSE HANFORD COMPANY
GENERATOR & WASTE ACCEPTANCE SERVICES

PREDETERMINATION REPORT

REQUEST #: 24929 *DATE:* October 5, 1994

PRODUCT	PREDETERMINATION OF GROUND WATER FROM NORTH SLOPE WELLS

TO	D. E. Skoglie	*COMPANY*	WHC		
PHONE	376-2341	*ADDRESS*	WNP-TR057, 400 AREA		
FACILITY	Well Services	*MSIN*	N3-05		
ANALYST	K. W. Chang KW Chang	*MSIN*	T3-05	*PHONE*	372-0679
REVIEWER	Richard J. [illegible] 10-7-94	*MSIN*	T3-05	*PHONE*	
cc	File				

According to current state and federal laws (WAC 173-303 and 40 CFR 261) and based upon lab. data submitted with the request, the three samples of North Slope site wells are all to be considered non-regulated waste water.
For questions or comments, please contact the Generator & Waste Acceptance Services analyst above and reference the request #. Thank you.

			REGULATED ?				
Item #	**MSDS #**	**Product/Material**	**Unused Product**	**Used Product**	**Empty Container**	**Rags with 10% Product**	**Possible Waste Codes**
-93 -61 -37	(n/a)	Ground Water Samples, North Slope Site					none

Comments:

cc:
Scott E. Myers N3-06
Marty G. Gardner N3-06

ATTACHMENT 2

WESTINGHOUSE HANFORD COMPANY
GENERATOR & WASTE ACCEPTANCE SERVICES

PREDETERMINATION REPORT

REQUEST #: 24929 *DATE:* October 5, 1994

PRODUCT	PREDETERMINATION OF GROUND WATER FROM NORTH SLOPE WELLS				
TO	D. E. Skoglie	*COMPANY*	WHC		
PHONE	376-2341	*ADDRESS*	WNP-TR057, 400 AREA		
FACILITY	Well Services	*MSIN*	N3-05		
ANALYST	K. W. Chang KW Chang	*MSIN*	T3-05	*PHONE*	372-0679
REVIEWER	Richard J. Alan 10-7-94	*MSIN*	T3-05	*PHONE*	
cc	File				

ccording to current state and federal laws (WAC 173-303 and 40 CFR 261) and based upon lab. data submitted with the request, the three samples of North Slope site wells are all to be considered non-regulated waste water.
For questions or comments, please contact the Generator & Waste Acceptance Services analyst above and reference the request #. Thank you.

			REGULATED ?				
Item #	**MSDS #**	**Product/Material**	**Unused Product**	**Used Product**	**Empty Container**	**Rags with 10% Product**	**Possible Waste Codes**
-93 -61 -37	(n/a)	Ground Water Samples, North Slope Site					none

Comments:

cc:
Scott E. Myers N3-06
Marty G. Gardner N3-06

CAM INDUSTRIES

Environmental Products and Services

424B 9th St. Prosser WA 99350 (509) 786-4554

August 16, 1994

Nancy Speaker Nething, R.G.
Consulting Groundwater Geologist
STACO Well Services
220 Academy St.
Mt. Angel, OR 97362

Dear Ms. Nething:

This letter is to explain field screening data obtained on August 15, 1994.

A Miran 1B, equipped with Spectra/Match, was used to screen for 400 plus compounds. An FTIR instrument was also used.

We have analyzed the data generated by Spectra/Match and have determined that it is highly unlikely anything exists in this well except for low volatile straight-chain hydrocarbons consistent with used motor oil.

When looking at data from Spectra/Match it is important to note that "Hit List" data is inconclusive, (i.e., non-detect) with HQIs greater than 1.5. Therefore, you will notice nothing was detected in that parameter.

I am also including the Spectra/Match Library List of compounds for your review. If you have any questions, please call.

Sincerely,

Cary A Martin

Cary A. Martin
President
CAM Industries
424B 9th Street
Prosser, WA 99350
(509) 786-4554
FAX (509) 786-4555

ARDL, INC.
Rt. 15E, Mt. Vernon Airport Industrial Park
Mt. Vernon, Illinois 62864

Report Date: 12 Sep 94

Project Name:	NORTH SLOPE	**Analysis:**	Inorganics
Project No.:	--	**Matrix:**	waste **Units:** mg/kg
QC Identifier:		**QC Batch Nos.:**	1548P (Method 3050) 1548F (Method 3050)
Customer Sample No.:	889-112-37-8194DL		
ARDL No.:	9870-2		

Analyte	Detection Limits	Results	Prep Method	Analysis Method	Prep Date	Analysis Date
Arsenic (GFAA)	0.40	< 0.40	3050	7060	08 Sep 94	12 Sep 94
Cadmium	0.50	< 0.50	3050	6010	08 Sep 94	09 Sep 94
Chromium	0.50	1.5	3050	6010	08 Sep 94	09 Sep 94
Lead (ICP)	2.5	2.8	3050	6010	08 Sep 94	09 Sep 94
Flashpoint (Deg. F)	--	> 200	--	1010	--	08 Sep 94
TOX	30.8	167	--	9020A	--	08 Sep 94

1D
PCB ORGANIC ANALYSIS

Customer Sample No.

699-112-37-9194DL

Lab Name: ARDL, Inc.
Lab Code: ________ Case No.: 9870

Contract: NORTH SLOPE
SAS No.: ______ SDG No.:

Matrix(soil/water) : WASTE
Sample(wt/vol) : 1.0 (g/mL) g
Level(low/med) : LOW
% Moisture(not dec): ---
Extraction(Sepf/Conc/Sonc) Dilution
GPC Cleanup (Y/N): N pH: ---
Final Extraction Volume: 10 mL

Lab Sample ID : 9870-2
Lab File ID :
Date Received : 09-06-94
Date Extracted : 09-08-94
Date Analyzed : 09-08-94
Dilution Factor: 1.0

Cas No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
12674-11-2	Aroclor 1016	6500	U
11104-28-2	Aroclor 1221	6500	U
11141-16-5	Aroclor 1232	6500	U
53469-21-9	Aroclor 1242	6500	U
12672-29-6	Aroclor 1248	6500	U
11097-69-1	Aroclor 1254	13000	U
11096-82-5	Aroclor 1260	13000	U

ATTACHMENT 3

WESTINGHOUSE HANFORD COMPANY
GENERATOR & WASTE ACCEPTANCE SERVICES

PREDETERMINATION REPORT

REQUEST #: 24929 *DATE:* October 5, 1994

PRODUCT	PREDETERMINATION OF GROUND WATER FROM NORTH SLOPE WELLS

TO	D. E. Skoglie	*COMPANY*	WHC		
PHONE	376-2341	*ADDRESS*	WNP-TR057, 400 AREA		
FACILITY	Well Services	*MSIN*	N3-05		
ANALYST	K. W. Chang KW Chang	*MSIN*	T3-05	*PHONE*	372-0679
REVIEWER	Richard J. Cla[illegible] 10-7-94	*MSIN*	T3-05	*PHONE*	
cc	File				

According to current state and federal laws (WAC 173-303 and 40 CFR 261) and based upon lab. data submitted with the request, the three samples of North Slope site wells are all to be considered non-regulated waste water.
For questions or comments, please contact the Generator & Waste Acceptance Services analyst above and reference the request #. Thank you.

Item #	MSDS #	Product/Material	REGULATED ? Unused Product	Used Product	Empty Container	Rags with 10% Product	Possible Waste Codes
-93 -61 -37	(n/a)	Ground Water Samples, North Slope Site					none

Comments:

cc:
Scott E. Myers N3-06
Marty G. Gardner N3-06

ARDL, INC.
Rt. 15E, Mt. Vernon Airport Industrial Park
Mt. Vernon, Illinois 62864

Report Date: 12 Sep 94

Project Name: NORTH SLOPE	Analysis: Inorganics
Project No.: --	Matrix: waste Units: mg/kg
QC Identifier:	QC Batch Nos.: 1548P (Method 3050)
Customer Sample No.: 889-115-81-9184DL	1548F (Method 3050)
ARDL No.: 9870-1	

Analyte	Detection Limits	Results	Prep Method	Analysis Method	Prep Date	Analysis Date
Arsenic (GFAA)	0.40	2.8	3050	7060	08 Sep 94	12 Sep 94
Cadmium	0.50	1.1	3050	6010	08 Sep 94	09 Sep 94
Chromium	0.50	18.0	3050	6010	08 Sep 94	09 Sep 94
Lead (ICP)	2.5	78.9	3050	6010	08 Sep 94	09 Sep 94
Flashpoint (Deg. F)	--	> 200	--	1010	--	08 Sep 94
TOX	19.7	103	--	9020A	--	08 Sep 94

1D

PCB ORGANIC ANALYSIS

Customer Sample No.

699-115-61-9194DL

Lab Name: ARDL, Inc. Contract: NORTH SLOPE
Lab Code: ________ Case No.: 9870 SAS No.: ______ SDG No.:

Matrix(soil/water) : WASTE Lab Sample ID : 9870-1
Sample(wt/vol) : 30.0 (g/mL) g Lab File ID :
Level(low/med) : LOW Date Received : 09-06-94
% Moisture(not dec): --- Date Extracted : 09-08-94
Extraction(Sepf/Conc/Sonc) SONC Date Analyzed : 09-09-94
GPC Cleanup (Y/N): N pH: --- Dilution Factor: 1.0
Final Extraction Volume: 1.0 mL

Cas No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
12674-11-2	Aroclor 1016	80	U
11104-28-2	Aroclor 1221	80	U
11141-16-5	Aroclor 1232	80	U
53469-21-9	Aroclor 1242	80	U
12672-29-6	Aroclor 1248	80	U
11097-69-1	Aroclor 1254	160	U
11096-82-5	Aroclor 1260	160	U

ATTACHMENT 4

WELL CONSTRUCTION AND COMPLETION SUMMARY (AS-BUILT)

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-112-37 A9111 TEMPORARY WELL NO: PSN 535, #8
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N 111,737 E/W W 36,569
Driller's Name: R. J. Strasser (?)	WA State Lic Nr: Not documented	State Coordinates: N 516,945 E 2,258,469
Drilling Company: Strasser Drilling Co	Company Location Portlanc, OR	Start Card #: Not documented T 15N R 27E S 32E
Date Started: Not documented	Date Complete: 29Jan54	Elevation Ground surface: Not documented

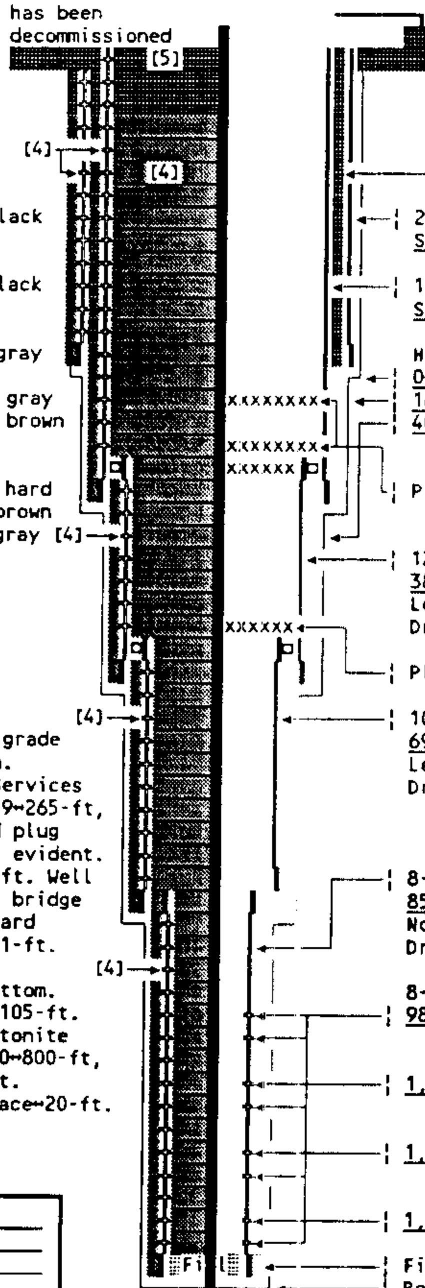
Depth to water: 262-ft Jan54
(Ground surface) 245-ft Oct94

Elevation of reference point:
741.82 ft (Southwest corner)

GENERALIZED STRATIGRAPHY Driller's Log

Borehole has been decommissioned

0~3: TOP SOIL
3~277: CALICHE and CLAY, some SAND
277~372: BASALT, porous black and gray
372~404: CLAY, SAND, TALUS
404~565: BASALT, gray and black
565~575: CLAY, gray
575~580: Coarse SAND, CLAY
580~765: BASALT, gray and black
765~862: CLAY, blue, yellow w/broken BASALT
862~982: BASALT, black and gray
982~998: BASALT, brown (W)
998~1034: BASALT, black and gray
1,034~1,038: CINDERS, red & brown
1,038~1,067: BASALT, black
1,067~1,077: BASALT, brown
1,077~1,107: BASALT, black, hard
1,107~1,115: BASALT, light brown
1,115~1,123: BASALT, hard, gray



Type of surface protection:
Concrete pump housing
Grout between 16~20-in casings

20-in ID carbon steel casing
Surface~188-ft w/steel drive shoe

16-in ID carbon steel casing
Surface~405-ft w/steel drive shoe

Hole diameter,
0~188-ft, 21-in nominal
188~405-ft, 17-in nominal
405~720-ft, 13-in nominal

Plugs @ 219~265-ft and @ 387~390-ft.

12-in ID carbon steel liner,
388~695-ft
Lead packer at top,
Drive shoes at top and bottom

Plug @ 685~690-ft

10-in ID carbon steel liner,
692~852-ft
Lead packer at top,
Drive shoes at top and bottom

8-in ID carbon steel liner,
857~1,123-ft
No packer by television scan
Drive shoes at top and bottom

8-in liner perforations,
982~995-ft, 9/ft/¾x4-in
1,034~1,038-ft, 9/ft/¾x4-in
1,067~1,077-ft, 9/ft/cx4-in
1,107~1,115-ft, 9/ft/¾x4-in

Fill, 1,111~1,123-ft
Borehole drilled depth: [1,123-ft]

DECOMMISSIONING ACTIVITIES:

1994 by USACOE

1] Partially removed pump structure. Remainder to be later removed to grade during site revegetaton.

04Aug~12Oct94 by WHC Well Services

2] Drilled on plug from 219~265-ft, rocks and trash. Pushed plug to 385-ft where oil was evident. Large cobble @ 387~390-ft. Well open to wood/metal/rock bridge @ 685~690-ft. Open to hard steel/metal plug @ 1,111-ft.
3] Jet shot perforated @ 4 charges/ft, from bottom. 5~385, 395~685, 700~1,105-ft.
4] Grouted w/Pure Gold bentonite grout 800~1,111-ft, 320~800-ft, 100~320-ft and 20~100-ft.
5] Placed cement plug surface~20-ft.

Drawing By: RKL/6N112W37.ASB
Date: 25Oct94
Reference:

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-93-93 A9087
Drilling Fluid Used: Not documented	Additives Used: Not documented	TEMPORARY PSN H 83 L WELL NO: Well-525
Driller's Name: Not documented	WA State Lic Nr: Not documented	Hanford Coordinates: N/S N 93,000 E/W W 93,000
Drilling Company: Strasser Drilling Co	Company Location Portland, OR	State Coordinates: N 498,000 E 2,202,000
Date Started: Not documented	Date Complete: May53	Start Card #: Not documented T 14N R 24E S21B1
		Elevation Ground surface: 637.0-ft Estimated

Depth to water: 240.0-ft 04May53
(Ground surface): 173-ft 25Sep94

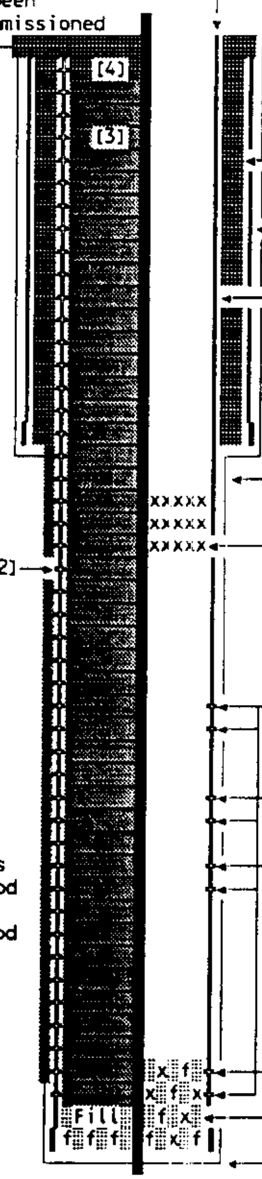
GENERALIZED STRATIGRAPHY

Driller's Log

Borehole has been decommissioned

Elevation of reference point: [639.0-ft]

0–77: Fine gray SAND
77–147: Clayey SAND-sandy CLAY
147–153: Gray SAND
153–197: Clayey SAND-sandy CLAY
197–214: Sandy clayey GRAVEL
214–227: Cemented GRAVEL
227–245: Sandy clayey GRAVEL
245–251: Cemented GRAVEL
251–258: Sandy clayey GRAVEL
258–268: Cemented GRAVEL
268–288: Sandy gravelly CLAY
288–310: CLAY
310–325: Sandy GRAVEL
325–342: Light brown CLAY
342–345: Loose sandy GRAVEL
345–367: Sandy clayey GRAVEL
367–371: Cemented GRAVEL
371–378: Sandy clayey GRAVEL
378–407: Cemented GRAVEL
407–429: Yellow CLAY
429–453: Gravelly CLAY
453–480: Blue SHALE
480–506: Sandy CLAY
506–513: Sandy clayey GRAVEL
513–520: Cemented GRAVEL



Type of surface protection: Cement grout between 20-in and 24-in casings

24-in heavy duty standard line pipe, Surface–175-ft

20-in heavy duty standard line pipe, +2.0–520-ft

Hole diameter,
0–175-ft, 25-in nominal
175–520-ft, 21-in nominal

Plug and obstructions, ~214–249-ft

20-in casing perforations,
262–270-ft
342–350-ft
360–370-ft
512–516-ft

Fill and obstructions, ~446–520-ft

Borehole drilled depth: [520-ft]

DECOMMISSIONING ACTIVITIES:
27Sep94–05Oct94
by WHC Well Services

1] Removed obstructions in well.
   214–216-ft: Hair, some oil
   216–249-ft: Grease, oil filters
   249–446-ft: Open hole, some wood
   446–498-ft: Hard wood,
   450–496-ft: Redrilled, sand/wood
   511–515-ft: Hard object metal cuttings.
2] Jet perforated @ 4 charges/ft in 12 runs. 5–497-ft.
3] Grouted w/335 bags Pure Gold bentonite grout, 20–515-ft.
4] Placed cement plug, 0–20-ft.

Drawing By: RKL/6N93W93.ASB
Date: 25Oct94
Reference: COE 71-05-37 27Feb57

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-115-61 A9115 TEMPORARY WELL NO: PSN 420, #7
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N 114,633 E/W W 60,597
Driller's Name: R. J. Strasser (?)	WA State Lic Nr: Not documented	State Coordinates: N 519,779 E 2,234,474
Drilling Company: Strasser Drilling Co	Company Location: Portland, OR	Start Card #: Not documented T 15N R 26E S 28Q
Date Started: Not documented	Date Complete: 01Sep53	Elevation Ground surface: Not documented

Depth to water: 317-ft Sep53
(Ground surface) 298.1-ft Jun90
293-ft Sep94

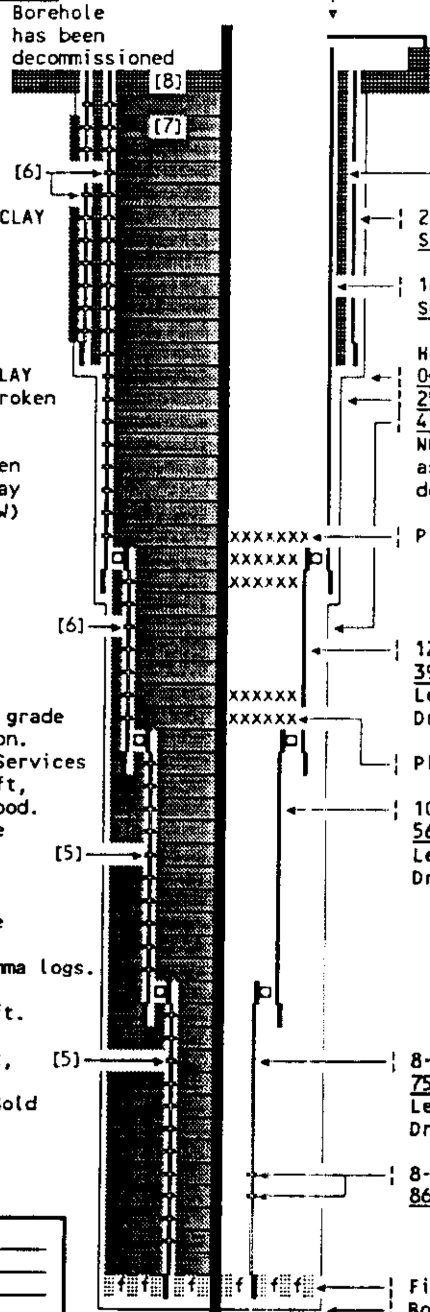
Elevation of reference point:
790.60 ft (Top Steel Plate)

GENERALIZED STRATIGRAPHY

Driller's Log

Borehole has been decommissioned

0↔13: TOPSOIL
13↔16: CLAY and GRAVEL
16↔23: Brown SAND
23↔216: Brown and gray CLAY
216↔276: CLAY and SAND, brown and gray
276↔298: Broken BASALT and CLAY
298↔341: Hard gray BASALT
341↔360: Porous black ROCK w CLAY
360↔366: Yellow CLAY
366↔398: Porous black ROCK
398↔522: Gray BASALT
522↔558: Gray, red, brown CLAY
558↔660: BASALT, gray and broken
660↔788: Yellow, brown and gray CLAY
788↔861: BASALT, gray, broken
861↔868: Red, yellow and gray broken (BASALT?) (W)
868↔892: Gray BASALT



Type of surface protection:
Cement pump housing
Grout between 16 and 20-in casings

20-in ID carbon steel casing,
Surface↔258-ft w/steel drive shoe

16-in ID carbon steel casing,
Surface↔415-ft w/steel drive shoe

Hole diameter,
0↔258-ft, 21-in nominal
258↔415-ft, 17-in nominal
415↔892-ft, 16-in nominal
NOTE: Hole diameter 415↔892-ft is assumed to be 16-in based on documented pump test

Plug, ~387↔429-ft

12-in ID carbon steel liner,
397↔582-ft
Lead packer at top,
Drive shoes at top and bottom

Plug, ~545↔557-ft

10-in ID carbon steel liner,
562↔767-ft
Lead packer at top,
Drive shoes at top and bottom

8-in ID carbon steel liner,
757↔892-ft
Lead packer at top,
Drive shoes at top and bottom

8-in casing perforations,
860↔870-ft, 9/ft/¾x4-in

Fill, ~873↔892-ft
Borehole drilled depth: [892-ft]

DECOMMISSIONING ACTIVITIES:
1994 by USACOE
1] Partially removed pump structure. Remainder to be later removed to grade during site revegetation.
15Aug↔27Sep94 by WHC Well Services
2] Drilled plug, 387↔429-ft, areas of soft debris/wood. Encountered oil w/large amounts VOCs. Cleaned. Open hole 429↔545-ft. Hard wood 545↔557-ft. Cleaned to 873-ft where metal was encountered.
3] Ran TV, caliper and gamma logs.
5] Perforated 750↔874 and 560↔748-ft, 4 cuts/rd/ft.
6] Jet-Shot perforated, 7↔392-ft and 402↔552-ft, 4 charges/ft.
7] Tremie grouted w/Pure Gold bentonite grout surface↔874-ft.
8] Placed cement cap.

Drawing By: RKL/6N115W61.ASB
Date: 25Oct94
Reference: HANFORD WELLS

WELL CONSTRUCTION AND COMPLETION SUMMARY

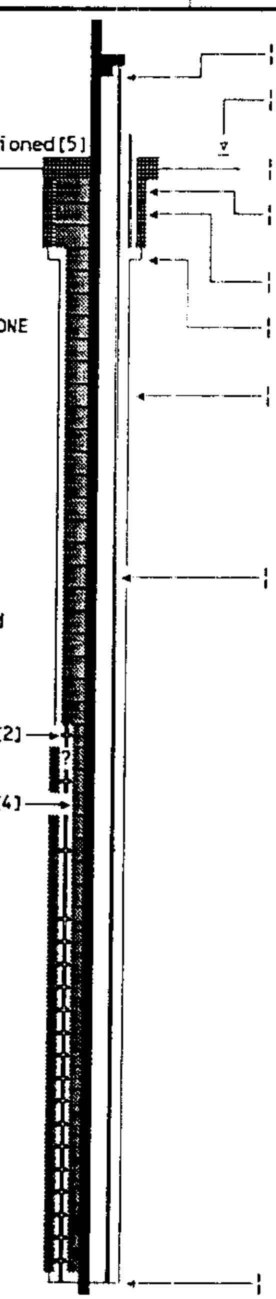
Drilling Method: Rotary bit (0–20-ft) Core (20–776)	Sample Method: Wireline core	WELL NUMBER: 699-70-17 A8968 TEMPORARY WELL NO: DH-19
Drilling Fluid Used: Drilling mud	Additives Used: Not documented	Hanford Coordinates: N/S N 70,387 E/W W 17,320
Driller's Name: Not documented	WA State Lic Nr: Not documented	State Coordinates: N N 475,644.24 E 2,277,824.59
Drilling Company: Boyles Bros	Company Location: Spokane, WA	Start Card #: Not documented T 13N R 27E S 11E1
Date Started: 10Dec79	Date Complete: 05Mar80	Elevation Ground surface: 883.95-ft Brass cap

Depth to water: Not documented
(Ground surface)

GENERALIZED STRATIGRAPHY	Geologist's Log	Borehole has been decommissioned[5]

0–20: Not sampled
20–84: Alternating CLAY & SILT
84–182: Fine–med SAND layers
182–206: SILTSTONE
206–335: Alternating SILTSTONE, CLAYSTONE & SAND
335–770: Alternating SILTSTONE, CLAYSTONE & SANDSTONE
770–>776: Elephant Mountain BASALT

DECOMMISSIONING ACTIVITIES:
16Aug–14Oct94
by WHC Well Services
1] Cleaned well to bottom.
2] Jet-Shot perforated, 502–776-ft in five runs. Hole blocked @ about 350-ft after last run.
3] Made TV camera run. Camera showed that casing below 350-ft was shattered and that formation material was blocking hole.
4] Ran tremie rods to 383.2-ft. Hit hard object. Pumped 12 bags of Pure Gold bentonite grout. Removed tremie.
5] Removed 384-ft of 3-in casing and 22-ft of 5-in casing. Grouted back to surface with Pure Gold grout. Placed cement cap and monument pin.



Drawing By: RKL/6N70W17.ASB
Date : 25Oct94
Reference : HANFORD WELLS

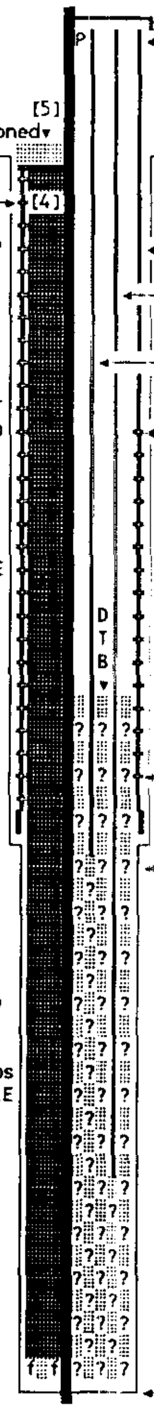
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool (nom)	WELL NUMBER: 699-61-16A A8927 TEMPORARY CC-133 WELL NO: Foster Ranch
Drilling Fluid Used: Water	Additives Used: Not documented	Hanford Coordinates: N/S N 61,467 E/W W 15,673
Driller's Name: Row	WA State Lic Nr: Not documented	State Coordinates: N 466,729 E 2,279,494
Drilling Company: Not documented	Company Location: Not documented	Start Card #: Not documented T 13N R 27E S 14R1
Date Started: 09Feb49	Date Complete: 08Sep50	Elevation Ground surface: 411.3-ft Estimated

Depth to water: 54-ft 08Sep50
(Ground surface) 50.6-ft 29Apr94

GENERALIZED STRATIGRAPHY (Extensively summarized) — Driller's Log — Borehole has been decommissioned [5]

0-45: Sandy CLAY and CALICHE
45-57: CLAY, CALICHE and SAND [3] [4]
57-67: Blue SHALE/CLAY @ SANDSTONE
67-85: Blue-gray SHALE, yellow CLAY @80'
85-95: Brown sandy CLAY or SHALE
95-105: Yellow-reddish brown CLAY
105-125: Red-brown CLAY/SHALE, CALICHE
125-140: Tan-brown sandy SILT
140-146: Fine white SAND and SILT
146-155: Lt CLAY and SAND, some GRAVEL
155-165: Fine white SAND, CLAY, tan SILT
155-185: Tan SILT, CLAY, fine white SAND (some SANSTONE & blue SHALE)
185-195: Fine white SAND, tan SILT/CLAY
195-205: Very fine white SAND and MUD
205-227: White SHALE, few GRAVEL/SAND
227-233: Red SAND, loose
233-245: Layers red-brn SAND/white SHALE
245-250: Blue SHALE, SAND, white CLAY
250-260: White & blue SHALE, SAND
260-270: White CLAY some SAND/SANDSTONE
270-278: White CLAY and SAND
278-279: Pink soapy CLAY, no SAND
279-286: Tight CLAY and SAND
286-300: White sandy CLAY
300-303: Blue SHALE, BASALT chips
303-309: Green SILT, SAND, BASALT chips
309-310: Black sandy BASALT
310-318: BASALT
318-323: BASALT, layers of black SHALE
323-330: BASALT
330-348: Layered blue SHALE, basalt GRAVEL, black lava MUD
348-367: BASALT
367-368: Fine gray SAND
368-436: BASALT (break @ 422-423-ft)
436-438.5: SANDSTONE/GRAVEL/CALICHE/SAND
438.5-451: BASALT
451-458: SHALE, MUD, BASALT chips, SAND
458-475: Gray SANDSTONE, ASH, SAND, chips
475-490: Lava MUD/BASALT chips/blue SHALE
490-510: Porous BASALT, w/blue SHALE
510-517: BASALT, some ASH
517-520: Loose BASALT and SAND
520-568: BASALT
568-581: BASALT w/volcanic ASH & MUD
581-583: Hard BASALT
583-600: Rotten BASALT
600-607: Hard BASALT



Elevation of reference point: [412.52-ft]
(top of casing)
Height of reference point above ground surface [2.1-ft]
Depth of surface seal [ND]
No surface seal documented:
8-in ID carbon steel casing, +2.1-300-ft
4-in ID carbon steel casing, ~+2.0-498-ft
1.5-in OD galvanized pipe, +~2.0-320-ft
9-in nominal hole, 0-300-ft
8-in casing perforated, 122-275-ft, 600-cuts total
9-in nominal hole, 0-300-ft
DTB=Depth to bottom, 227.0-ft, 29Apr94
8-in nominal hole, 303-607-ft

DECOMMISSIONING ACTIVITIES:
18Aug-06Sep94 by WHC Well Services
1] Removed 1.5-in pipe and 4-in casing.
2] Cleaned hole to 605-ft.
3] Perforated 8-in casing, 3-300-ft, 4 cuts/rd/ft.
4] Cement grouted w/tremie 3-605-ft.
5] Cut casing @ 3-ft, place cap and filled to grade.

Drawing By: RKL/6N61W16A.ASB
Date : 28Sep94
Reference : HANFORD WELLS

Borehole drilled depth: [607.0-ft]

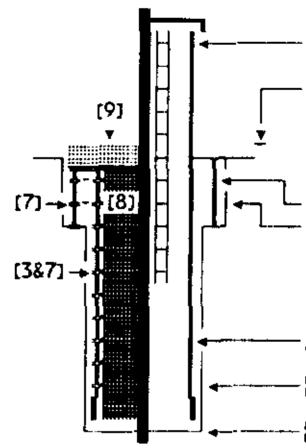
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool nominal	Sample Method: Not documented	WELL NUMBER: 699-61-16B A8928 TEMPORARY WELL NO: Foster Ref-7
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N~61,450 E/W W~15,700
Driller's Name: Not documented	WA State Lic Nr: Not documented	State Coordinates: N ~466,730 E~2,279,500
Drilling Company: Not documented	Company Location: Not documented	Start Card #: Not documented T 13N R 27E S 14R2
Date Started: Not documented	Date Complete: Not documented	Elevation Ground surface: 406.7-ft Estimated

Depth to water: Not documented
(Ground surface) 56.6-ft 29Apr94

GENERALIZED STRATIGRAPHY | Driller's Log

(no log available)



Elevation of reference point: [408.00-ft]
(top of casing)
Height of reference point above [1.3-ft]
ground surface
Depth of surface seal [ND]
No surface seal documented:
8-in ID carbon steel casing, 0↔ND
9-in nominal hole, 0↔ND

5-in ID carbon steel casing, +1.3↔~113-ft
6-in nominal hole, ND↔~113-ft
Borehole drilled depth: [~113-ft]

DTB=Depth to bottom inside tubing
74.9-ft, 29Apr94

NOTE: Has two strings of 1.5-in carbon steel tubing, one has pump

DECOMMISSIONING ACTIVITIES:
06↔13Sep94 by WHC Well Services
1] Removed 1.5-in tubings and pump. Cleaned out.
2] Made TV run. Depth and casing to about 113-ft.
3] Perforated 6-in casing, 5↔105-ft @ 4 cuts/rd/ft.
4] Cement grouted, 3↔~113-ft.
5] Cut casing @ 3-ft. Found 8-in starter casing to unknown depth.
6] Drilled cement plug out.
7] Perforated 6 and 8-in casings, 7↔107-ft w/Jet-Shot perforator, 4 cuts/ft/rd.
8] Regrouted 3-ft to bottom w/cement.
9] Placed cap and filled to grade.

Drawing By: RKL/6N61W16B.ASB
Date : 28Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-61-16B

WELL DESIGNATION	:	699-61-37
CERCLA UNIT	:	Not applicable
RCRA FACILITY	:	Not applicable
HANFORD COORDINATES	:	N ~61,450 W ~15,700
LAMBERT COORDINATES	:	N~466,730 E~2,279,500 [Estimated]
DATE DRILLED	:	Not documented
DEPTH DRILLED (GS)	:	~81-ft
MEASURED DEPTH (GS)	:	74.9-ft, 29Apr94 (Inside 1.5-in tubing), ~113-ft, 06Sep94
DEPTH TO WATER (GS)	:	56.6-ft, 29Apr94
CASING DIAMETER	:	5-in carbon steel, 3↔113-ft nominal, 8-in carbon steel, 3↔not documented
ELEV TOP CASING	:	~404-ft, Estimated
ELEV GROUND SURFACE	:	406.7-ft, Estimated
PERFORATED INTERVAL	:	Perforted, 3↔107-ft during decommissioning
SCREENED INTERVAL	:	None documented
COMMENTS	:	FIELD INSPECTION, 29Apr94 5-in carbon steel casing, 2 1.5-in inner casings. Capped, not locked No pad, posts or permanent identification. Not in radiation zone. OTHER: Borehole decommissioned, 06↔13Sep94 by WHC Well Services
AVAILABLE LOGS	:	None
TV SCAN COMMENTS	:	Not applicable
LISTED USE	:	None
CURRENT USER	:	None - borehole has been decommissioned
PUMP TYPE	:	None
MAINTENANCE	:	

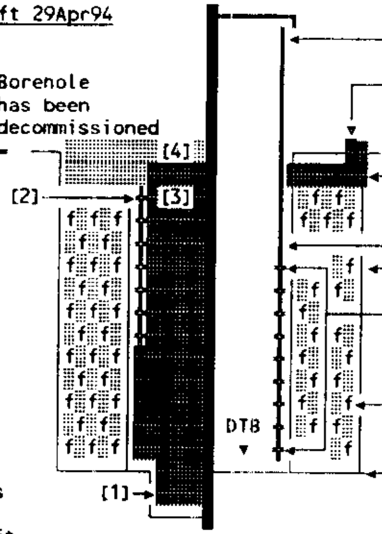
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Not documented	Sample Method: Not documented	WELL NUMBER: 699-51-7 A8820 TEMPORARY WELL NO:
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N~51,000 E/W W ~7,000
Driller's Name: Not documented	WA State Lic Nr: Not documented	State Coordinates: N ~456,284 E ~2,288,194
Drilling Company: Not documented	Company Location: Not documented	Start Card #: Not documented T 13N R 28E S 30J1
Date Started: Not documented	Date Complete: Not documented	Elevation Ground surface: 398.4-ft Estimated

Depth to water: Dry @ 22.6-ft 29Apr94
(Ground surface)

GENERALIZED STRATIGRAPHY | Driller's Log | Borenole has been decommissioned

No log available



Elevation of reference point: [400.00-ft]
(top of casing)

Height of reference point above [1.6-ft]
ground surface

Depth of surface seal [ND]
No surface seal documented:
Has ~3x4-ft concrete foundation or pump base

12-in ID corrugated casing, +1.6↔~21-ft

24-in nominal hole, 0↔ND-ft

12-in casing perforated,
7↔~21-ft, 4 cuts/rd/ft

Probable fill

Borehole drilled depth: [~21-ft]

DTB=Depth to bottom,
22.6-ft, 29Apr94

DECOMMISSIONING ACTIVITIES:
29Aug94 by WHC Well Services
1] Drilled out below corrugated liner to 28-ft.
2] Tried to pull liner, retrieved 10-ft.
3] Cement grouted well, 3-ft to bottom.
4] Removed pad, cut liner @ 3-ft and filled to grade.

Drawing By: RKL/6N51W07.ASB
Date : 28Sep94
Reference : HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-51-7

WELL DESIGNATION	:	699-51-7
RCRA FACILITY	:	Not applicable
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N ~51,000 W ~7,000 [Estimated]
LAMBERT COORDINATES	:	N 456,284 E 2,288,194 [HANCONV]
DATE DRILLED	:	Not documented
DEPTH DRILLED (GS)	:	Not documented
MEASURED DEPTH (GS)	:	22.6-ft, 29Apr94
DEPTH TO WATER (GS)	:	Dry @ 22.6-ft, 29Apr94
CASING DIAMETER	:	12-in, corrugated galvanized steel, ~3↔not documented
ELEV TOP OF CASING	:	Not applicable
ELEV GROUND SURFACE	:	398.4-ft, Estimated
PERFORATED INTERVAL	:	Original ~ 7↔21-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 03Jan92, 12-in galvanized steel casing. Capped and locked 2.9 x 3.8-ft concrete foundation or pump base. No posts or permanent identification. Not in radiation zone. OTHER: Borehole decommissioned, 29Aug94 by WHC Well Services
AVAILABLE LOGS	:	None
TV SCAN COMMENTS	:	Not applicable
LISTED USE	:	None documented
CURRENT USER	:	None - borehole has been decommissioned
PUMP TYPE	:	None
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-111-24 — TEMPORARY WELL NO: PSN 500-1
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N 111,000 — E/W W 24,000
Driller's Name: R. J. Strasser (?)	WA State Lic Nr: Not documented	State Coordinates: N 516,240 — E 2,271,040
Drilling Company: Strasser Drilling Co	Company Location Portland, OR	Start Card #: Not documented — T15N R27E S34L
Date Started: Within 1951	Date Complete: 20Jan52	Elevation Ground surface: Not documented

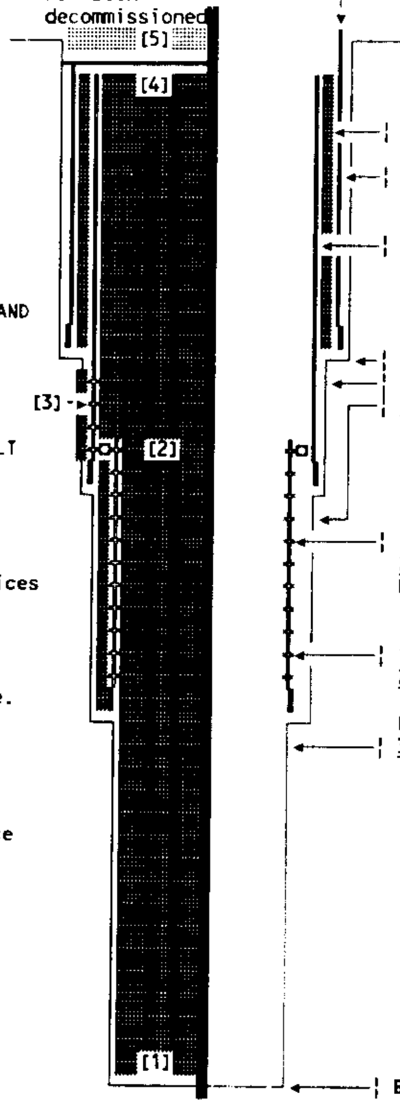
Depth to water: 271-ft Jan52

Elevation of reference point: 699.14 ft (Top of casing)

GENERALIZED STRATIGRAPHY — Driller's Log

Borehole has been decommissioned

0↔109: TOPSOIL and CLAY
109↔208: Reddish-brown SHALE
208↔219: Brown & grey ROCK
219↔229: Alternate layers-hard & soft ROCK
229↔238: Hard grey BASALT-green CLAY seams
238↔269: Porous black BASALT
269↔297: Hard black BASALT
297↔351: Porous black BASALT w/interbedding of SAND (40 gpm water)
351↔509: Hard black and grey BASALT
509↔535: Grey BASALT-blue CLAY in seams
535↔603: Grey and black BASALT
603↔628: Grey porous BASALT
628↔636: Hard BASALT



Type of surface protection: Cement pump pad

Grout between 16 and 20-in casings,

20-in ID carbon steel casing, Surface↔108-ft w/steel drive shoe

16-in ID carbon steel casing, Surface↔255-ft w/steel drive shoe

Hole diameter,
0↔108-ft, 21-in nominal
108↔255-ft, 17-in nominal
255↔353.5-ft, 13-in nominal

12-in ID carbon steel liner, 245↔353.5-ft w/steel drive shoe
May have lead packer at top

12-in liner perforations, 245↔353-ft, 12/ft/¾x4-in

Hole diameter, 353.5↔636.0-ft, 12-in nominal

Borehole drilled depth: [636.0-ft]

DECOMMISSIONING:
09↔15Aug94 by WHC Well Services

1] Cleaned out to bottom.

2] Grouted w/neat cement, 250↔636-ft in ~100-ft stages using tremmie pipe.

3] Perforated 16-in casing, 110↔240-ft, 4 cuts/rd/ft.

4] Grouted 16-in casing to ~3-ft below ground surface w/neat cement.

5] Cut casings @ ~3-ft. Placed cap, filled to grade and compacted.

Drawing By: RKL/6N111W24.ASB
Date: 28Sep94
Reference:

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-111-24

WELL DESIGNATION	:	699-111-24
RCRA FACILITY	:	Not applicable
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 111,000 W 24,000 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 516,240 E 2,271,200 [HANCONV]
DATE DRILLED	:	Jan52
DEPTH DRILLED (GS)	:	636.0-ft
MEASURED DEPTH (GS)	:	636-ft, 09Aug94
DEPTH TO WATER (GS)	:	271.0-ft, Jan52
CASING DIAMETER	:	20-in carbon steel, 3↔108-ft, 16-in carbon steel, 3↔255-ft, 12-in carbon steel, 245↔353.5-ft
ELEV TOP CASING	:	~696-ft after removal of 3-ft
ELEV GROUND SURFACE	:	~700-ft
PERFORATED INTERVAL	:	12-in liner, 245↔353-ft 16-in casing, 110↔240-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, OTHER; Borehole has been decommissioned
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	None documented
CURRENT USER	:	None - Borehole decommissioned by WHC Well Services, 09↔15Aug94
PUMP TYPE	:	None
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY AS-BUILT

Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-86-95 A9061 TEMPORARY WELL NO: PSN H83C
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N 86,000 E/W W 95,000
Driller's Name: R. J. Strasser (?)	WA State Lic Nr: Not documented	State Coordinates: N 491,058 E 2,200,105
Drilling Company: Strasser Drilling Co	Company Location Portland, OR	Start Card #: Not documented T 14N R 25E S 28E1
Date Started: Not documented	Date Complete: Not documented	Elevation Ground surface: 871-ft Estimated

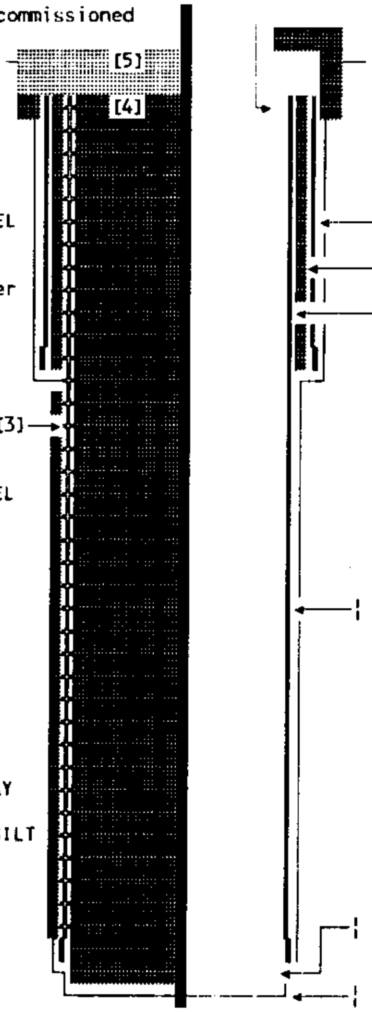
Depth to water: ~483-ft Not documented

Borehole has been decommissioned

Elevation of reference point: ~873-ft

GENERALIZED Driller's STRATIGRAPHY Log

0–16: Coarse SAND
16–33: Coarse SAND-
some GRAVEL
33–46: SAND
46–51: SAND, some GRAVEL
51–69: SAND w/CLAY binder
69–123: Packed SAND, some GRAVEL
123–142: SAND w/CLAY binder
142–149: SAND & GRAVEL
149–206: Dirty SAND, CLAY binder
206–215: Packed SAND
215–219: Dirty SAND
219–227: SAND & GRAVEL
227–236: SAND w/CLAY binder
236–249: Packed SAND
249–331: Dirty SAND
331–341: SAND, some GRAVEL
341–354: Fine brown SAND
354–369: SAND, some large GRAVEL
369–396: SAND & GRAVEL
396–417: Dirty SAND
417–423: SAND, some GRAVEL
423–483: SAND, w/GRAVEL >>6-in
483–511: SAND & GRAVEL
(Water bearing)
511–538: SAND w/CLAY binder
coated with blue clay,
538–547: Cemented GRAVEL
547–569: SAND & GRAVEL
(Water bearing)
569–577: SAND, GRAVEL & CLAY
577–593: GRAVEL, BOULDERS & CLAY
593–607: SAND & GRAVEL
607–616: Large GRAVEL, SAND & SILT
616–623: Cemented GRAVEL
623–648: GRAVEL & CLAY



NOTE: Construction details not documented but assumed to similar to other wells of this depth.
Type of surface protection: Not documented

May have 24-in casing
Assumed surface–Not documented

Cement grout assumed

20-in casing, 0–636-ft

No perforations documented,
May have been perforated
@ water bearing zones logged.

Open hole, 636–648-ft

Borehole drilled depth: [648-ft]

DECOMMISSIONING ACTIVITIES:
11May–31Aug94 by WHC Well Services
1] TV run had water @ 436-ft and cement plug @ 442-ft.
2] Cleaned out to bottom. Ran TV and caliper log.
20-in casing to 636-ft and depth to bottom, 648-ft.
3] Perforated from bottom of pump structure to bottom of casing @ ~636-ft, 4 cuts/rd/ft.
4] Cement grouted hole in stages. Placed cap on casing.
5] Removed pump structure and filled to grade.

Drawing By: RKL/6N86W95.ASB
Date: 29Sep94
Reference: COE 71-05-37 27Feb57

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-86-95

WELL DESIGNATION	:	699-86-95
RCRA FACILITY	:	Not applicable
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 86,000 W 95,000 [Hanford Wells]
LAMBERT COORDINATES	:	N 491,058 E 2,200,105 [HANCONV]
DATE DRILLED	:	Not documented, 1951 or 1952
DEPTH DRILLED (GS)	:	648-ft
MEASURED DEPTH (GS)	:	648-ft, 23Aug94
DEPTH TO WATER (GS)	:	436-ft, 11May94
CASING DIAMETER	:	20-in ID carbon steel, ~0-636-ft
ELEV TOP CASING	:	~873-ft [HANFORD WELLS]
ELEV GROUND SURFACE	:	~871-ft, Estimated
PERFORATED INTERVAL	:	None documented
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, OTHER; Borehole decommissioned by WHC Well Services, 22-28Aug94
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	20-in casing
LISTED USE	:	Army camp water supply
CURRENT USER	:	None - borehole has been decommissioned
PUMP TYPE	:	None
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

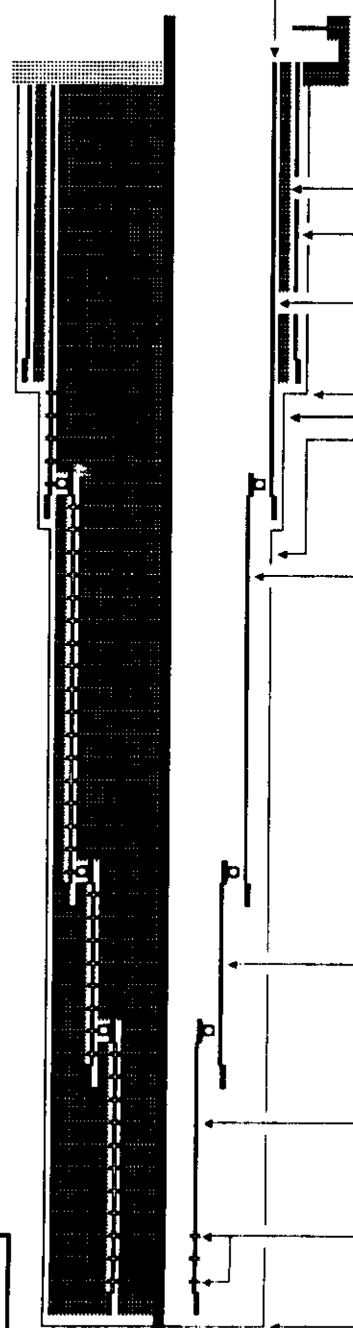
Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-92-14 A9082 TEMPORARY WELL NO: PSN 505, #9
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N 92,000 E/W W 14,000
Driller's Name: R. J. Strasser (?)	WA State Lic Nr: Not documented	State Coordinates: N 497,266 E 2,281,000
Drilling Company: Strasser Drilling Co	Company Location Portland, OR	Start Card #: Not documented T 14N R 27E S 24C1
Date Started: Not documented	Date Complete: 10Nov53	Elevation Ground surface: Not documented

Depth to water: 383-ft Nov53

Elevation of reference point: 862.01-ft (Top of casing)

GENERALIZED STRATIGRAPHY / Driller's Log

0–3: CLAY, SILT, TOP SOIL
3–9: CALICHE
9–206: Light brown CLAY
206–573: Blue, brown green CLAY
573–580: Pea GRAVEL with CLAY
580–589: SANDSTONE
589–601: Hard gray BASALT
601–631: Soft red porous BASALT
631–697: Black and gray BASALT
697–730: Green and blue SHALE
730–874: Black and gray BASALT
874–883: Porous red ROCK and CLAY
883–1027: Porous black BASALT
1027–1165: Black and gray BASALT
1165–1191: Blue CLAY
1191–1246: Gray and black BASALT
1246–1261: Porous black BASALT
1261–1276: CONGLOMERATE
1276–1283: Blue CLAY
1283–1291: CONGLOMERATE, rotten wood, pyrite
1291–1371: Black BASALT
1371–1393: Porous black BASALT
1393–1396: BASALT



Type of surface protection: Concrete pump housing

Grout between 16–20-in casing

20-in carbon steel casing, Surface–297-ft w/drive shoe

16-in carbon steel casing, Surface–576-ft w/drive shoe

21-in nominal hole, 0–297-ft

297–576-ft, 17-in nominal

576–1,396-ft, 16-in nominal

NOTE: Hole diameter may be less than 16-in. However, a pump test was documented in 16-in hole to 1,396-ft.

12-in carbon steel liner, 558–1,038-ft
Lead packer at top and drive shoes at top and bottom.

10-in carbon steel liner, 1,028–1,201-ft
Lead packer at top and drive shoes at top and bottom

8-in carbon steel liner, 1,185–1,396-ft
Lead packer at top and drive shoes at top and bottom

8-in casing perforations, 1,370–1,393-ft, 9 cuts/ft
Cuts %x4-in

Borehole drilled depth: [1,396-ft]

DECOMMISSIONING ACTIVITIES:
12–22Sep94 by WHC Well Services

1] Cleaned out well to bottom.
2] Perforated with Jet-Shot perforator, 300–1,395-ft.
3] Cement grouted from bottom of concrete structure to 1,396-ft w/tremmie pipe in stages.
4] Placed cap, removed pad and filled to grade.

Drawing By: RKL/6N92W14.ASB
Date: 29Sep94
Reference:

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 699-92-14

WELL DESIGNATION	:	699-92-14
RCRA FACILITY	:	Not applicable
CERCLA UNIT	:	Not applicable
HANFORD COORDINATES	:	N 92,000 W 14,000 [HANFORD WELLS]
LAMBERT COORDINATES	:	N 497,266 E 2,281,000 [HANCONV]
DATE DRILLED	:	Nov53
DEPTH DRILLED (GS)	:	1,396-ft
MEASURED DEPTH (GS)	:	1,396-ft, 12Sep94
DEPTH TO WATER (GS)	:	383-ft, Nov53
CASING DIAMETER	:	20-in carbon steel, surface↔297-ft, 16-in carbon steel, surface↔576-ft, 12-in carbon steel, 558↔1,038-ft, 10-in carbon steel, 1,028↔1,201-ft, 8-in carbon steel, 1,185↔1,396-ft
ELEV TOP CASING	:	862.01-ft [HANFORD WELLS]
ELEV GROUND SURFACE	:	Not documented
PERFORATED INTERVAL	:	300↔1,395-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, OTHER; Borehole decommissioned, 12↔22Sep94 by WHC Well Services
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
LISTED USE	:	Army camp water supply
CURRENT USER	:	None - borehole has been decommissioned
PUMP TYPE	:	None
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

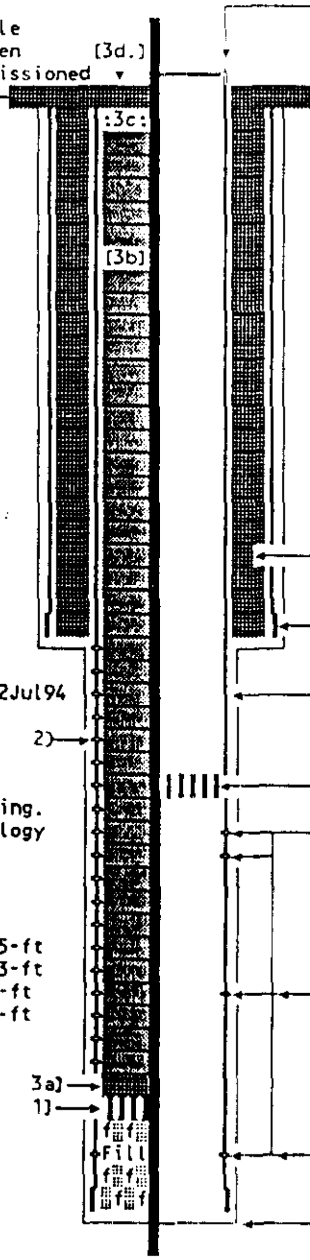
Drilling Method: Cable tool	Sample Method: Hard tool	WELL NUMBER: 699-79-104 — TEMPORARY PSN 82 WELL NO: Well-515
Drilling Fluid Used: Not documented	Additives Used: Not documented	Hanford Coordinates: N/S N 79,000 — E/W W 104,000
Driller's Name: Not documented	WA State Lic Nr: Not documented	State Coordinates: N 484,035 — E 2,191,122
Drilling Company: Strasser Drilling Co	Company Location Portland, OR	Start Card #: Not documented — T14N R25E S31M1
Date Started: Not documented	Date Complete: Feb53	Elevation Ground surface: 775.0-ft Estimated

Depth to water: 375.7-ft 10Feb53
(Ground surface) 354-ft 31May94

GENERALIZED STRATIGRAPHY — Driller's Log — Borehole has been decommissioned [3d.]

Elevation of reference point: [775.6-ft]

0–~5: TOPSOIL
~5–37: Loose black SAND
37–60: Gravelly SAND
60–130: Coarse GRAVELS w/COBBLES & BOULDERS
130–166: Clayey GRAVEL
166–219: Brown & black SAND
219–294: Clayey SAND
294–340: Sandy GRAVEL cemented in part with some COBBLES & BOULDERS
340–429: Clayey sandy GRAVEL
429–450: Sandy GRAVEL with littel CLAY
450–512: Clayey sandy GRAVEL
512–516: Sandy GRAVEL
516–672: Sandy clayey GRAVEL
672–684: Sandy GRAVEL with very little CLAY
684–699: Clayey sandy GRAVEL



Type of surface protection: May have cement pump housing

Grout seal between 16–24-in casings

24-in heavy duty standard line pipe casing, Surface–304-ft

16-in heavy duty standard line pipe casing, +1.5–699-ft

Plug @ 370-ft

16-in casing perforations, 429–436-ft

512–516-ft

672–674-ft

Borehole drilled depth: [699-ft]

DECOMMISSIONING:
By WHC Well Services Support for US Corps of Engineers, 31May94–12Jul94

1] Drilled plug from 370-ft to 635-ft. Plug refused to go farther. Unable to remove by extensive fishing or drilling. Received concurrence from Ecology to plug well from 635-ft.
2] Perforated 304–633-ft, 4 rows of 7 cuts per foot.
3] Installed grout using tremie:
   a. Neat cement, 603–635-ft
   b. Pure Gold Bentonite 29–603-ft
   c. Bentonite chips 25–29-ft
   d. Neat cement cap 0–25-ft

Drawing By: RKL/6N79W104.ASB
Date: 22Jul94
Reference: COE 71-05-37 27Feb57

WATER WELL REPORT

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 33597
UNIQUE WELL I.D. # 699-112-37
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, WA 99352

(2) LOCATION OF WELL: County Grant SE 1/4 NW 1/4 Sec 32 T. 15N N., R 27E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one) ____
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ] Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 1,123 feet. Depth of completed well 1,123 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built

Casing installed: ____" Diam. from ____ ft. to ____ ft.
Welded [ ] ____" Diam. from ____ ft. to ____ ft.
Liner installed [ ] ____" Diam. from ____ ft. to ____ ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used ____
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ____
Type ____ Model No ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel ____
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes [X] No [ ] To what depth? ____ ft.
Material used in seal ____
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name NA
Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level ____ ft. below top of well Date ____
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? ____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level) NA

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started 8/08/94, 19__ Completed 10/14/94, 19__

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970 Richland, WA 99352
(Signed) David E. Skoglie D.E. Skoglie (WELL DRILLER) License No. 1580

Contractor's Registration No. NA Date 10/14/94, 19 NA

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 33649
UNIQUE WELL I.D. # A9087
699-93-93
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, Washington 99352

(2) LOCATION OF WELL: County Benton SE 1/4 SW 1/4 Sec 21 T. 14N N., R 2 YE W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ] Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 20 inches.
Drilled 520 feet. Depth of completed well 520 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ____" Diam. from NA ft. to ____ ft.
Welded [ ] ____" Diam. from ____ ft. to ____ ft.
Liner installed [ ] ____" Diam. from ____ ft. to ____ ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Jet Shot
SIZE of perforations 5/8 inch dia in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel ____
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes [X] No [ ] To what depth? ____ ft.
Material used in seal ____
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level ____ ft. below top of well Date ____
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? ____
Yield: ____ gal./min. with NA ft. drawdown after ____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started 09/27/94, 19__ Completed 10/15, 19 94

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970 Richland, WA 99352
(Signed) David E. Skoglie D.E. Skoglie (WELL DRILLER) License No. 1580
Contractor's Registration No. NA Date 10/15/94, 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 24610
UNIQUE WELL I.D. # 699-115-61
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, WA 99352

(2) LOCATION OF WELL: County Grant SW 1/4 SE 1/4 Sec 28 T. 15N N., R. 26E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ] Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 892 feet. Depth of completed well 892 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built

Casing installed: ___" Diam. from ___ ft. to ___ ft.
Welded [ ] ___" Diam. from ___ ft. to ___ ft.
Liner installed [ ]
Threaded [ ] ___" Diam. from ___ ft. to ___ ft.

Perforations: Yes [X] No [ ]
Type of perforator used Holt/Jet-Shot
SIZE of perforations ___ in. by ___ in.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ___ ft. to ___ ft.

Surface seal: Yes [X] No [ ] To what depth? ___ ft.
Material used in seal
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name NA
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ___ ft.
Static level ___ ft. below top of well Date
Artesian pressure ___ lbs. per square inch Date
Artesian water is controlled by ___ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
" " " "
" " NA " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest ___ gal./min. with stem set at ___ ft. for ___ hrs.
Artesian flow ___ g.p.m. Date
Temperature of water ___ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started 8/15/94, 19 . Completed 9/27, 1994

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address P.O. Box 1970 Richland, WA 99352

(Signed) David E. Skoglie D. E. Skoglie (WELL DRILLER) License No. 1580

Contractor's Registration No. NA Date 10/4/94, 19 NA

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 32006
UNIQUE WELL I.D. # 699-70-17
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, WA

(2) LOCATION OF WELL: County Franklin NE 1/4 NW 1/4 Sec 11 T. 13N N., R. 27E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other X

(4) TYPE OF WORK: Owner's number of well (If more than one) A8968
Abandoned X New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 3.5 inches.
Drilled 776.0 feet. Depth of completed well 776.0 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 4.5 " Diam. from 0 ft. to 20.0 ft.
Welded ☐ 3.5 " Diam. from 0 ft. to 776.0 ft.
Liner installed ☐ " Diam. from ft. to ft.
Threaded X

Perforations: Yes X No ☐
Type of perforator used Jet-Shot
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No X
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No X Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

NA

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
See Attached As-Built		

Work Started 8/18/94, 19. Completed 10/14, 19 94

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970 Richland, WA 99352
(Signed) David E. Skoglie D. E. Skoglie (WELL DRILLER) License No. 1580
Contractor's Registration No NA Date 10/94, 19 NA

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 32003
UNIQUE WELL I.D. # 699-61-16A
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, Washington 99352

(2) LOCATION OF WELL: County Franklin SE 1/4 SE 1/4 Sec 14 T. 13N N., R. 27E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one) A8927
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ]
Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 8 inch inches
Drilled 607 feet. Depth of completed well 607 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built

Casing installed: ___ " Diam. from ___ ft. to ___ ft.
Welded [ ] ___ " Diam. from ___ ft. to ___ ft.
Liner installed [ ] ___ " Diam. from ___ ft. to ___ ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Holt
SIZE of perforations 1/4 in. by 1 1/2 in.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ___
Type ___ Model No. ___
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel packed: Yes [ ] No [X] Size of gravel ___
Gravel placed from ___ ft. to ___ ft.

Surface seal: Yes [X] No [ ] To what depth? ___ ft.
Material used in seal ___
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? ___ Depth of strata ___
Method of sealing strata off ___

(7) PUMP: Manufacturer's Name NA
Type: ___ H.P. ___

(8) WATER LEVELS: Land-surface elevation above mean sea level 50.6 ft.
Static level 52. ft. below top of well Date 8/22/94
Artesian pressure ___ lbs. per square inch Date ___
Artesian water is controlled by ___ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? ___
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
		NA			

Date of test ___
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest ___ gal./min. with stem set at ___ ft. for ___ hrs.
Artesian flow ___ g.p.m. Date ___
Temperature of water ___ Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started Aug. 18, 19 94 Completed Sept. 6, 19 94

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970 Richland, WA 99352
(Signed) D.E. SKOGLIE DE Skoglie (WELL DRILLER) License No. 1580
Contractor's Registration No. NA Date 09/23, 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 32004
UNIQUE WELL I.D. # 699-61-16B
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, Washington 99352

(2) LOCATION OF WELL: County Franklin - SE 1/4 SE 1/4 Sec 14 T. 13 N., R 27E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ]
Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 5 inches
Drilled 107 feet. Depth of completed well 107 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built
Casing Installed: ___" Diam. from ___ ft. to ___ ft.
Welded [ ] ___" Diam. from ___ ft. to ___ ft.
Liner installed [ ] ___" Diam. from ___ ft. to ___ ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Jet Shot
SIZE of perforations ___ in. by ___ in.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ___
Type ___ Model No. ___
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel packed: Yes [ ] No [X] Size of gravel ___
Gravel placed from ___ ft. to ___ ft.

Surface seal: Yes [X] No [ ] To what depth? ___ ft.
Material used in seal ___
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? ___ Depth of strata ___
Method of sealing strata off ___

(7) PUMP: Manufacturer's Name NA
Type: ___ H.P. ___

(8) WATER LEVELS: Land-surface elevation above mean sea level ___ ft.
Static level ___ ft. below top of well Date ___
Artesian pressure ___ lbs. per square inch Date ___
Artesian water is controlled by ___ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? ___
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

NA

Date of test ___
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest ___ gal./min. with stem set at ___ ft. for ___ hrs.
Artesian flow ___ g.p.m. Date ___
Temperature of water ___ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started Sept. 6, 19 94. Completed Sept. 13, 19 94

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970 Richland, WA 99352
(Signed) D.E. Skoglie DE Skoglie (WELL DRILLER) License No. 1580
Contractor's Registration No. NA Date 09/23, 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 32005
UNIQUE WELL I.D. # 699-51-7
Water Right Permit No. NA

(1) OWNER: Name U. S. Department of Energy Address Richland, Washington 99352

(2) LOCATION OF WELL: County Franklin NW 1/4 SE 1/4 Sec 30 T. 13N N., R. 28E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ]
Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 12 inches.
Drilled 28 feet. Depth of completed well 21 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built

Casing installed: " Diam. from ft. to ft.
Welded [ ] " Diam. from ft. to ft.
Liner installed [ ] " Diam. from ft. to ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Previously Installed
SIZE of perforations in. by in.
perforations from 7 ft. to 21 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name NA
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
			NA		

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started Aug. 29, 19 94 Completed Aug. 29, 19 94

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address P.O. Box 1970 Richland, WA 99352

(Signed) D.E. SKOGLIE D.E. Skoglie License No. 1580
(WELL DRILLER)

Contractor's Registration No. NA Date 09/23, 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 33647
UNIQUE WELL I.D. # 699-111-24
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, Washington 99352

(2) LOCATION OF WELL: County Grant NW 1/4 SE 1/4 Sec 34 T. 15 N., R 27E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one) NA
Abandoned [ ] New well [ ] Deepened [ ] Reconditioned [ ] Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 12 inches
Drilled 636 feet Depth of completed well 636 ft.

(6) CONSTRUCTION DETAILS: Reference attached as-built
Casing Installed: ___" Diam. from ___ ft. to ___ ft.
Welded [ ] ___" Diam. from ___ ft. to ___ ft.
Liner installed [ ] ___" Diam. from ___ ft. to ___ ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Holt
SIZE of perforations 1/4 in. by 1 1/2 in.
4 cuts/rd/ft perforations from 110 ft. to 240 ft.
perforations from ___ ft. to ___ ft.
perforations from ___ ft. to ___ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name ___
Type ___ Model No. ___
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel packed: Yes [ ] No [X] Size of gravel ___
Gravel placed from ___ ft. to ___ ft.

Surface seal: Yes [X] No [ ] To what depth? Reference as-built ft.
Material used in seal ___
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? ___ Depth of strata ___
Method of sealing strata off ___

(7) PUMP: Manufacturer's Name NA
Type: ___ H.P. ___

(8) WATER LEVELS: Land-surface elevation above mean sea level Not documented ft.
Static level 271 ft ft. below top of well Date Jan 52
Artesian pressure NA lbs. per square inch Date NA
Artesian water is controlled by NA (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? ___
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
		NA			

Date of test ___
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest ___ gal./min. with stem set at ___ ft. for ___ hrs.
Artesian flow ___ g.p.m. Date ___
Temperature of water ___ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-built		

Work Started 08/04/94, 19. Completed 08/15, 1994

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970
D.E. Skoglie
(Signed) David E. Skoglie (WELL DRILLER) License No. 1580

Contractor's Registration No. NA Date 09/23, 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 33650
UNIQUE WELL I.D. # 699-86-95
Water Right Permit No. NA

(1) OWNER: Name ~~U. S. Department of Energy~~ Address ~~Richland, Washington 99352~~

(2) LOCATION OF WELL: County Benton SW 1/4 SW 1/4 Sec 16 T. 14N N., R. 25E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ] Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 20 inches
Drilled 648 feet Depth of completed well 636 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built

Casing installed: ___" Diam. from ___ ft. to ___ ft.
Welded [ ] ___" Diam. from ___ ft. to ___ ft.
Liner installed [ ] ___" Diam. from ___ ft. to ___ ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Holt
SIZE of perforations 1/4 in. by 1½ in.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ___ ft. to ___ ft.

Surface seal: Yes [X] No [ ] To what depth? ___ ft.
Material used in seal
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name NA
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ___ ft.
Static level 438.7 ft. below top of well Date 8/23/94
Artesian pressure ___ lbs. per square inch Date
Artesian water is controlled by ___ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
			NA		

Date of test
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest ___ gal./min. with stem set at ___ ft. for ___ hrs.
Artesian flow ___ g.p.m. Date
Temperature of water ___ Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started Aug. 18, 1994 Completed Aug. 31, 1994

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 1970 Richland, WA 99352
(Signed) D. E. SKOGLIE DE Skoglie (WELL DRILLER) License No. 1580
Contractor's Registration No. NA Date 09/23, 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 22932
UNIQUE WELL I.D. # 699-92-14
Water Right Permit No. NA

(1) OWNER: Name U.S. Department of Energy Address Richland, Washington 99352

(2) LOCATION OF WELL: County Benton NE 1/4 NW 1/4 Sec 24 T. 14N N., R. 27E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) NA

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one)
Abandoned [X] New well [ ] Deepened [ ] Reconditioned [ ]
Method: Dug [ ] Cable [ ] Rotary [ ] Bored [ ] Driven [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 1,396 feet. Depth of completed well 1,396 ft.

(6) CONSTRUCTION DETAILS: Ref. Attached As-Built

Casing installed: " Diam. from ft. to ft.
Welded [ ] " Diam. from ft. to ft.
Liner installed [ ] " Diam. from ft. to ft.
Threaded [ ]

Perforations: Yes [X] No [ ]
Type of perforator used Jet-Shot
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

NA

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Reference Attached As-Built		

Work Started Aug. 31, 1994. Completed Sept. 22, 1994

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Westinghouse Hanford Company
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address P.O. Box 1970 Richland, WA 99352

(Signed) D.E. SKOGLIE D.E. Skoglie License No. 1580
(WELL DRILLER)

Contractor's Registration No. NA Date 09/23, 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. A33643
UNIQUE WELL I.D. # 699-79-104
Water Right Permit No. ______

(1) OWNER: Name US Dept of Energy Address Richland, WA

(2) LOCATION OF WELL: County Grant NW 1/4 SW 1/4 Sec 3 T 14 N., R 25E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) ______

(3) PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (If more than one) ______
Abandoned X New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well ______ inches.
Drilled ______ feet Depth of completed well ______ ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ______" Diam. from ______ ft. to ______ ft.
Welded ☐ ______" Diam. from ______ ft. to ______ ft.
Liner installed ☐ ______" Diam. from ______ ft. to ______ ft.
Threaded ☐

Perforations: Yes ☐ No ☐
Type of perforator used ______
SIZE of perforations ______ in. by ______ in.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ______
Type ______ Model No. ______
Diam. ______ Slot size ______ from ______ ft. to ______ ft.
Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel packed: Yes ☐ No ☐ Size of gravel ______
Gravel placed from ______ ft. to ______ ft.

Surface seal: Yes ☐ No ☐ To what depth? ______ ft.
Material used in seal ______
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ______ Depth of strata ______
Method of sealing strata off ______

(7) PUMP: Manufacturer's Name ______
Type: ______ H.P. ______

(8) WATER LEVELS: Land-surface elevation above mean sea level ______ ft.
Static level ______ ft. below top of well Date ______
Artesian pressure ______ lbs. per square inch Date ______
Artesian water is controlled by ______ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ______
Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______
Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.
Airtest ______ gal./min. with stem set at ______ ft. for ______ hrs.
Artesian flow ______ g.p.m. Date ______
Temperature of water ______ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
SEE ATTACHED ASBUILT		

Work Started ______, 19__ Completed ______, 19__

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Staco Well Services, Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 220 Academy St Mt. Angel OR 97362
(Signed) [signature] (WELL DRILLER) License No. 2223
Contractor's Registration No. STACO WS13101H Date July 26, 1994

(USE ADDITIONAL SHEETS IF NECESSARY)

SECTION 5

V-0202-01

Geophysics Survey
2,4-D Site
Hanford-North Slope

April 1994

Cascade Earth Sciences, Ltd.
7515 N.E. Ambassador Place
Portland, Oregon 97220

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
400 N. 34th St. • Suite 100
P.O. Box 300303
Seattle, Washington 98103
206•632•8020

TABLE OF CONTENTS

Page

1.0 PROJECT DESCRIPTION 1

- 1.1 Introduction 1
- 1.2 Site Background and Description 1
- 1.3 Purpose and Scope 2

2.0 GEOPHYSICS SURVEY 2

2.1 Theory and Application 2

- 2.1.1 Magnetometer 2
- 2.1.2 EM Device 3

- 2.2 Field Methods 3

3.0 DATA INTERPRETATION 4

- 3.1 General 4
- 3.2 Tank Location 5
- 3.3 Tank Depth 6

4.0 DISCUSSION AND RECOMMENDATIONS 6

LIST OF FIGURES

Figure No.	
1	Vicinity Map
2	Contoured Magnetometer Data 2, 4-D Site
3	Tank Locations 2, 4-D Site

APPENDIX

IMPORTANT INFORMATION ABOUT YOUR SUBSURFACE WASTE MANAGEMENT (REMEDIATION) REPORT

GEOPHYSICS SURVEY
2,4-D SITE
HANFORD - NORTH SLOPE

APRIL 1994

U.S. ARMY CORPS OF ENGINEERS
WALLA WALLA, WASHINGTON
CONTRACT NO. DACW 68-93-D-0002
DELIVERY ORDER 4

1.0 PROJECT DESCRIPTION

1.1 Introduction

This report summarizes the results of a geophysics survey conducted by Shannon & Wilson, Inc. at the 2,4-D disposal site located at Hanford - North Slope. The work was performed for the U.S. Army Corps of Engineers, Walla Walla District (COE), under contract #DACW 68-93-D-0002, Delivery Order No. 4. A magnetometer survey was performed on February 17 and 18, and a search using electromagnetic methods was performed on March 13, 1994. Shannon & Wilson performed this work as a subconsultant to Cascade Engineering Services, Portland, Oregon.

1.2 Site Background and Description

The North Slope consists of approximately 140 square miles of land north and east of the Columbia River across from the active area of the Hanford Site. The 2,4-D site is located on the North Slope approximately 25 miles north of the city of Richland, Washington. The location is shown on the Vicinity Map (Figure 1).

The 2,4-D site is located at the base of an approximately 60-foot-high sand dune to the west and approximately one quarter mile west of a gravel road. The dimensions of the site are approximately 440 by 60 feet with the long dimension approximately north-south parallel to the large sand dune. Signs marking the site are posted at the north and south ends. The site is vegetated with cheatgrass and sage.

According to documents supplied by the COE, soil contaminated with between 150 to 900 gallons of 2,4-D (2,4-Dichlorophenoxyacetic acid, a commercial herbicide) was buried at the site in 1966. The contaminated soil was generated from leaking, U.S. Bureau of Reclamation storage tanks in Eltopia, Washington. In 1967, the 2,4-D storage tanks were crushed and buried at the site as well. Documentation differs as to whether 6 or 10 storage tanks were buried at the site.

1.3 Purpose and Scope

As part of a previous study by others, a magnetometer was used to crudely locate the buried tanks, and 8 borings were advanced across the site but away from the tanks to obtain soil samples for contamination testing. The purpose of our work was to more precisely locate the tanks so that angle borings can be drilled close to the edges of the tanks to obtain soil samples from beneath the tanks. For our work, a magnetometer and a shallow electromagnetic (EM) device was used to locate the tanks.

2.0 GEOPHYSICS SURVEY

2.1 Theory and Application

2.1.1 Magnetometer

Ferromagnetic objects, such as iron and steel, have an induced magnetic field when subject to the earth's magnetic field (primary field). This magnetization causes a secondary magnetic field in the vicinity of the object. The magnetometer measures total field, which is the magnitude of the resultant of the primary and secondary magnetic field vectors measured in the direction of the earth's magnetic field. The secondary magnetic field may add to or subtract from the earth's magnetic field, resulting in a local detectable magnetic anomaly. The magnetic anomaly may be symmetrical or asymmetrical and may have both positive and negative peaks depending on the shape, orientation, and the polarization of an object.

To conduct a magnetometer survey, numerous measurements of the total field are made over an area, generally with a fixed offset between measuring points. Anomalous readings, both positive and negative, indicate the presence of nearby ferromagnetic objects. Because magnetic intensity decreases inversely proportional to the square of the distance from an object, relatively high values may represent small objects close to the sensor or larger objects at depth or some radial distance away.

The instrument used in the magnetometer survey is an Envi-Mag, a portable, microprocessor-based, proton precession magnetometer. The Envi-Mag takes total field readings in units of nano-Teslas (nT) at 0.5 second intervals. With such a fast sampling rate, measurements can be obtained while walking. Data is acquired rapidly while maintaining a close sampling interval. The data was stored by the magnetometer and later transferred to a computer for data display and analysis.

2.1.2 EM Device

A Garrett EM device was also used for tank detection. This device is useful for shallow metal detection. A transmitter coil in the instrument induces a primary magnetic field in the near subsurface. In the presence of metals, a secondary magnetic field is produced and measured by a receiver coil. The device produces an audible tone and a needle response on a semi-quantitative scale, but no record of the output is recorded.

For such large targets as the crushed tanks, the depth of detection of the EM device is limited to approximately 9 to 12 feet. With this EM device, surface area is more critical for detection than the mass of the target and edges of targets are readily detected. The EM device was used to sweep the approximate perimeter of the buried tanks to further refine the edges of the tanks.

2.2 Field Methods

A rectangular grid 400 feet (north-south) by 80 feet (east-west) was established over the disposal area using cloth tapes for distance measurement and a surveying instrument for establishing right angles. The grid in the east-west direction was centered relative to the two signs marking the disposal area, and the northern edge of the grid was established at the northern boundary sign.

The grid consisted of north-south survey lines with stations along each line. The lines were marked at each end of the survey area and at 50-foot intervals along the lines. The lines are spaced 10 feet apart. The lines are numbered 0 to 80 beginning at the western boundary, and the stations numbered 0 to 400 beginning at the southern boundary (refer to Figure 2).

Magnetometer readings were obtained while walking along each line. With total field measured every 0.5 seconds, readings were obtained along each line at a spacing of between 2.2 and 2.6 feet. An event marker was triggered at each 50-foot station to tie the readings to the grid. The magnetometer linearly interpolates the data between the 50-foot station stakes.

Magnetic field strengths vary with time. With large magnetometer surveys, field strength is often periodically recorded at one or several set locations during the survey to record field strength variations with time. As our magnetometer data was acquired within an hour, no base or tie-line readings were performed.

A reconnaissance of the disposal area was performed to visually locate any surface debris that may account for any magnetic anomalies recorded. Other than some iron pipes and brackets located outside the survey boundaries approximately 115 feet east of line 80, station 125, no significant debris was observed in the vicinity of the disposal area.

After reviewing the magnetometer data, it was decided to follow this work with an EM search. Though tank depths and locations were determined, an EM search was conducted to further refine the perimeter of the tanks as this is critical in planning the borings.

3.0 DATA INTERPRETATION

3.1 General

The field data was contoured with computer software supplied with the magnetometer to delineate magnetic anomalies and to evaluate tank locations. In addition, the data was transferred to a commercial spreadsheet software package, and individual survey lines were profiled to aid in data interpretation.

Figure 2 shows the contoured magnetometer data. Values of total field range between 53,058 and 58,092 nT. However, over most of the survey area, the non-anomalous, total field background is generally between 55,680 and 55,720 nT. An area of large anomalous values of total field are indicated between stations 60N and 160N on lines 0E through 60E. This area roughly corresponds with the area previously identified as containing the buried tanks.

The magnitude of the anomalous values above and below the background level is consistent with values expected for large storage tanks. Minor anomalies can be seen outside of the area identified above, but the magnitude of these anomalies are too small for tanks and may be from scattered, small metallic debris. The data confirms the previous magnetometer work, that the tanks are grouped into one portion of the disposal area, with the rest of the disposal area free from large magnetic debris.

3.2 Tank Location

Large metal tanks generally act as magnetic dipoles. At the latitude and longitude of the site, the field lines of the earth's magnetic field are inclined approximately 70 degrees from the horizontal. An anomaly produced by a dipole in such an inclined field often takes the form of a sinusoidal wave with the positive portion of the anomaly to the south and the negative portion to the north. The source of the anomaly is located between the high and the low.

This field strength behavior is apparent on Figure 3, which shows the contoured data for just the strongly anomalous area. The contoured data takes the form of an elongate high generally trending parallel to the survey lines. An elongate low parallels the high and is displaced to the north relative to the high. The southern portions of both the high and low areas are offset to the east between about stations 80N and 95N.

As previously discussed, the tanks are approximately located between the highs and the lows in the total field data. Having multiple targets in such close proximity, however, complicates interpretation of the anomaly, as the anomaly is a composite from several sources. To confirm and further refine the tank locations, the EM device was used. The EM device is particularly useful for determining the location of the edges of targets.

The shaded area on Figure 3 shows the inferred location of the tanks. The perimeter of this area was marked with orange pin flags during the second visit to the site. We were not able to determine the actual lateral boundaries between two adjacent tanks using either the magnetometer or the EM device.

3.3 Tank Depth

To determine the depth of the tanks, the half width rule for dipoles was used. In this method, the depth of the anomaly source is related to the half-width of the anomaly. The half-width is the horizontal distance between the maximum of the anomaly and the point where the total field is one-half the maximum value. For dipole sources the depth to the center of the source is twice the half-width.

Profiles drawn across the anomaly were used to determine the half-width and thus depth to the center of the source. From the half-width rule, a depth of about 7 feet to the center of the crushed tanks was determined. There is uncertainty with this method, particularly in that we are measuring a composite anomaly from more than one object. This method also generally over-estimates depths.

4.0 DISCUSSION AND RECOMMENDATIONS

To drill an angle hole beneath the crushed tanks without hitting the tanks, the bottom, outside edge of the adjacent tank or tanks needs to be determined. The perimeter of the combined tank mass was determined with the magnetometer and EM device and is marked in the field. The depth to the bottom of the tanks below the marked perimeter, however, is more problematic and requires some assumptions.

The approximate depth to the center of the tank mass is estimated to be 7 feet below the ground surface. The depth to the top of the tanks and the thickness of the crushed tanks can not be determined from the data, so the depth to the bottom of the tanks is unknown. Further, the tanks may have been stacked during burial, with one tank on top of another. The dimensions of the individual tanks are not known, but the number of local, paired highs and lows along the composite anomaly suggests less than 6 to 10 tank locations in plan view. This would support the possibility of stacked tanks.

Disposal documentation provided by the COE indicates that the contaminated soil was buried 4 feet below grade. As the crushed tanks were place on top of the contaminated soil, the report of the previous 2,4-D site study suggested that this implied that the contaminated soil was buried much deeper than 4 feet. Four feet may, however, be a reasonable estimate of the soil cover over the tanks.

If one assumes that 4 feet of soil covers the tops of the tanks and the center of the tanks is estimated to be 7 feet below grade, then the bottom of the tanks would be 10 feet below grade. In our opinion, 10 feet below grade may be excessive as it appears that burying the tanks to this depth would be unlikely with such a wide area available for disposal. An estimated depth of 10 feet to the bottom of the tanks would, in our opinion, err on the side of safety when planning the borings. It is our recommendation that the borings planned for sampling beneath the tanks be drilled with an appropriate offset and inclination to pass at least 10 feet below the flagged perimeter of the tanks.

Included in this report is an appendix entitled "Important Information About Your Subsurface Waste Management (Remediation) Report" to assist you and others in the use and limitations of our report.

SHANNON & WILSON, INC.

REGISTERED PROFESSIONAL
OREGON
THEODOR W. HOPKINS
No. G1192
GEOLOGIST

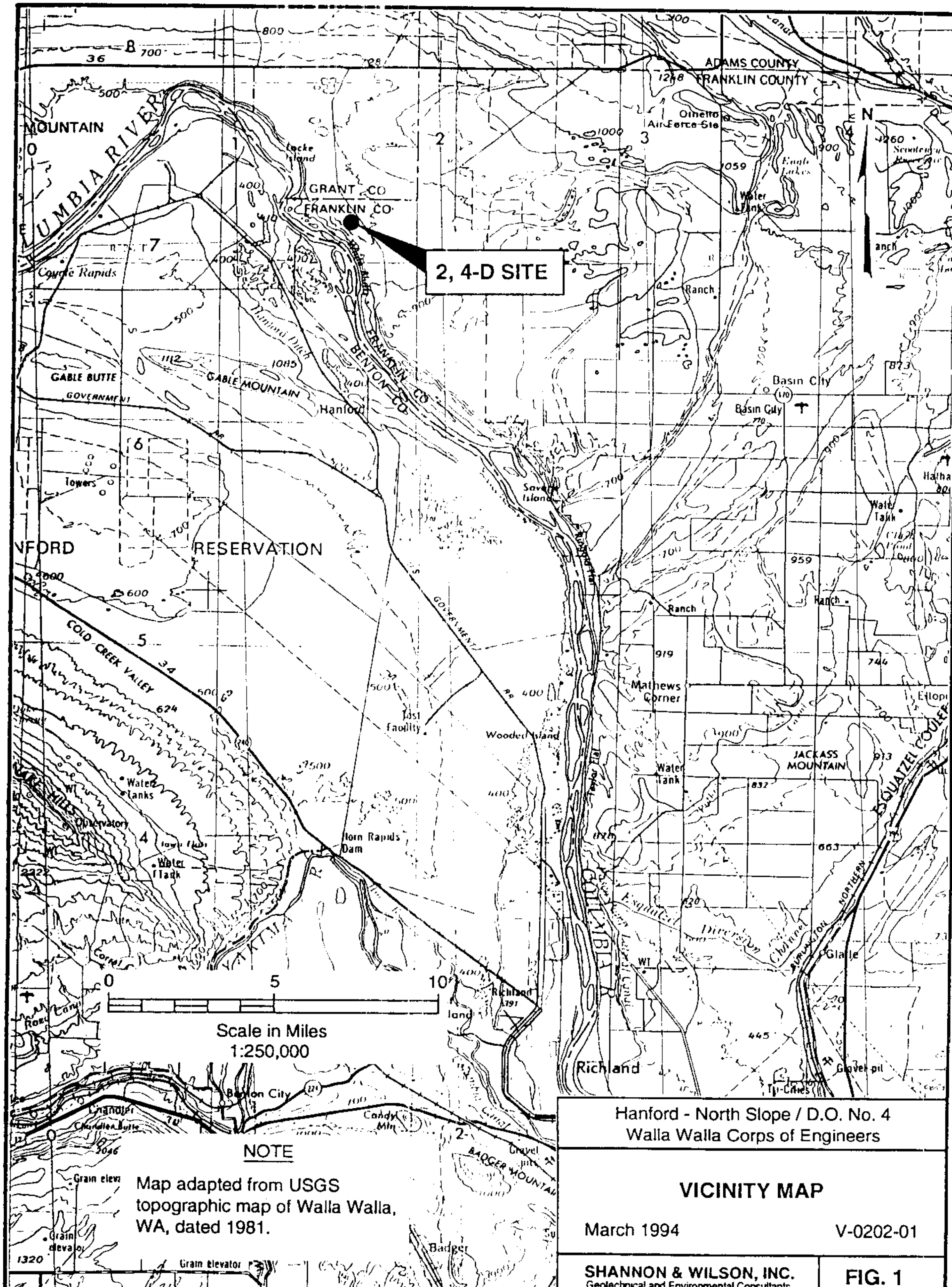
EASA T. ABED
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 12/11/94

4/6/94

Theodor W. Hopkins, R.G.
Geologist

Jess T. Abed, P.E.
Vice President

TWH:JTA/twh
4-5-94/V0202-01.RPT/V0202-lkd/lkd



0 5 10

Scale in Miles
1:250,000

NOTE

Map adapted from USGS topographic map of Walla Walla, WA, dated 1981.

Hanford - North Slope / D.O. No. 4
Walla Walla Corps of Engineers

VICINITY MAP

March 1994 V-0202-01

SHANNON & WILSON, INC.
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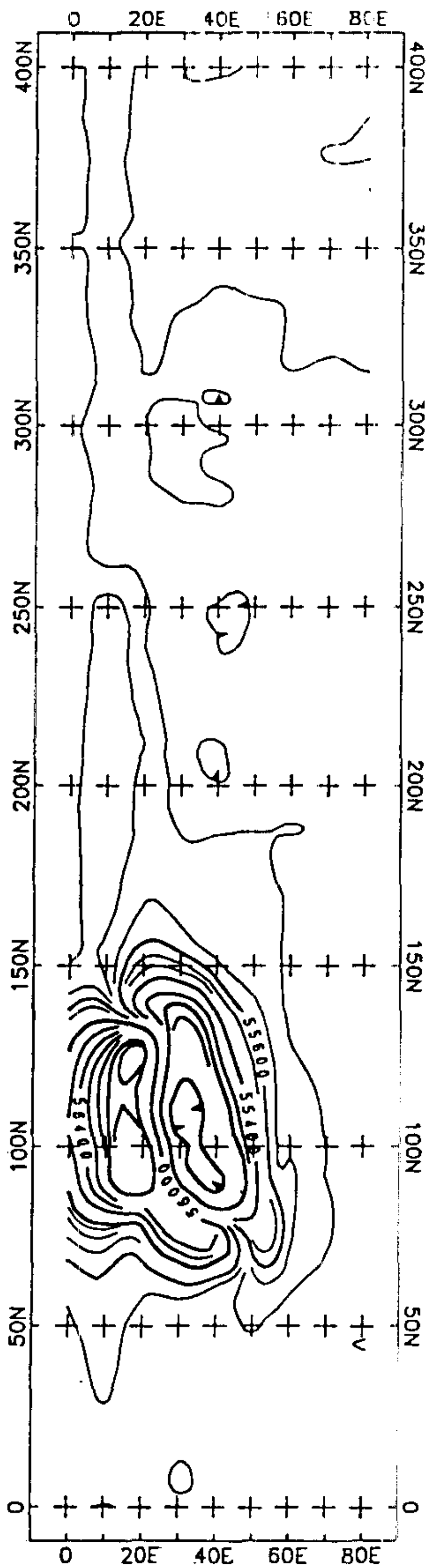
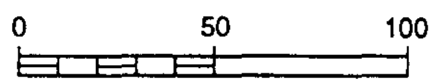
FIG. 1



LEGEND

56000 — Contours of Total Field Magnetometer Data in Nano-Teslas.

\+ Staked Stations



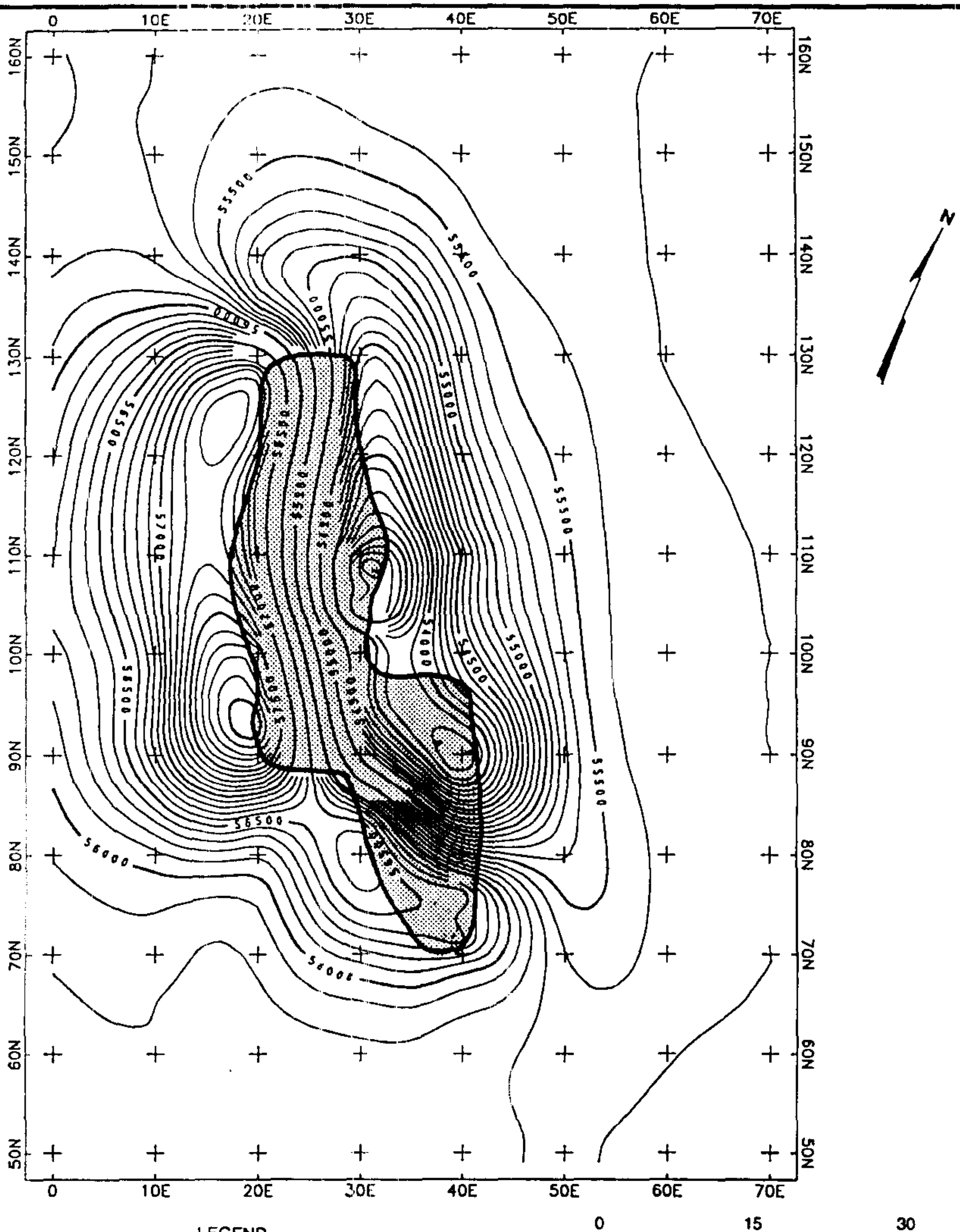
Hanford - North Slope / D.O. No. 4
Walla Walla Corps of Engineers

CONTOURED MAGNETOMETER DATA 2, 4-D SITE

March 1994 V-0202-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2



LEGEND

Location of Crushed Tanks

56000 Contours of Total Field Magnetometer Data in Nano-Teslas.

NOTES

1. Boundary of buried tanks interpreted from magnetometer data and shallow electro magnetic device.

2. Cross ticks shown at 10-foot stations are for location purposes only. Stations at 50-foot intervals were actually staked in the field.

Hanford - North Slope / D.O. No. 4
Walla Walla Corps of Engineers

TANK LOCATIONS
2, 4-D SITE

March 1994 V-0202-01

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

APPENDIX

IMPORTANT INFORMATION ABOUT YOUR SUBSURFACE WASTE MANAGEMENT (REMEDIATION) REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to Report

Dated: March 31, 1994

To: U.S. Army Corps of Engineers
Walla Walla, Washington

Important Information About Your Geotechnical Engineering/ Subsurface Waste Management (Remediation) Report

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS.

Consulting geotechnical engineers prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer/geoscientist.

AN ENGINEERING REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical engineering/subsurface waste management (remediation) report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, have the consulting engineer(s)/scientist(s) evaluate how any factors which change subsequent to the date of the report, may affect the recommendations. Unless your consulting geotechnical/ engineer and/or scientist indicates otherwise, your report should not be used: 1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); 2) when the size, elevation, or configuration of the proposed project is altered; 3) when the location or orientation of the proposed project is modified; 4) when there is a change of ownership; or 5) for application to an adjacent site. Geotechnical/civil engineers and/or scientists cannot accept responsibility for problems which may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural changes or human influence. Because a geotechnical/waste management engineering report is based on conditions which existed at the time of subsurface exploration, construction decisions should not be based on an engineering report whose adequacy may have been affected by time. Ask the geotechnical/waste management consultant to advise if additional tests are desirable before construction starts. For example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/waste management report. The geotechnical/civil engineer and/or scientist should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST GEOTECHNICAL RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help minimize their impact. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your geotechnical engineer's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Because actual subsurface conditions can be discerned only during earthwork, you should retain your geotechnical engineer to observe actual conditions and to finalize conclusions. Only the geotechnical engineer who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The geotechnical engineer who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE GEOTECHNICAL ENGINEERING/SUBSURFACE WASTE MANAGEMENT (REMEDIATION) REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical engineering/subsurface management (remediation) report. To help avoid these problems, the geotechnical/civil engineer and/or scientist should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological and waste management findings and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE ENGINEERING/WASTE MANAGEMENT REPORT.

Final boring logs developed by the geotechnical/civil engineer and/or scientist are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical engineering/waste management reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To minimize the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/waste management report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical engineering/subsurface waste management (remediation) is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical/ waste management consultants. To help prevent this problem, geotechnical/civil engineers and/or scientists have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the engineer's or scientist's liabilities to other parties; rather, they are definitive clauses which identify where the engineer's or scientist's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your engineer/scientist will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

SECTION 6

U.S. Army Corps of Engineers
2,4-D Site Report

Prepared for: U.S. Army Corps of Engineers
Walla Walla District Corps of Engineers
Regional Airport, Building 614
Walla Walla, WA 99362

Prepared by: Cascade Earth Sciences, Ltd.
7515 N.E. Ambassador Place, Suite L
Portland, OR 97220
(503) 282-7502

File PN 352059
August 25, 1994

DRAFT

TABLE OF CONTENTS

1.0 PROJECT BACKGROUND/OBJECTIVE 1

2.0 FIELD INVESTIGATION 1

3.0 ANALYTICAL RESULTS/CONCLUSIONS 3

Tables

Figures

Figure 1. Vicinity Map
Figure 2. Site Plan
Figure 3. Cross Section Showing Locations of Soil Sample Collection in Vertical Profile

Appendices

Appendix A. Boring Logs
Appendix B. Laboratory Reports and Chain-of-Custody

1.0 PROJECT BACKGROUND/OBJECTIVE

The 2,4-D Site is located in the Hanford North Slope Area (Figure 1) approximately 25 miles north of the city of Richland, Washington. The site is located approximately 0.5 miles east of the Columbia River within Section 35, Township 27 East, Range 14 North. The site consists of an area approximately 60 feet in width by 440 feet in length which runs parallel to the base of a semi-stabilized sand dune which is approximately 60 feet in height (Figure 2). The area had been used to dispose of approximately 50 cubic yards of soil which had been impacted by 2,4-D. The impacted soil had resulted from the release of approximately 900 gallons from storage tanks located in Eltopia, Washington. After disposal of the soils in a shallow trench constructed at the base of the sand dune, the tanks themselves were flattened and buried at the site.

2,4-D is a chlorinated herbicide which was used to control vegetation. The herbicide can be metabolized by bacteria and is generally not as persistent in the environment as are most other herbicides. Previously, eight soil samples were collected at the site using a rotary auger drilling rig and analyzed in the field using a field screening test. Only one sample indicated the presence of 2,4-D, however, laboratory analysis of this sample and other selected samples did not contain detectable levels of chlorinated herbicides.

The objective of the current project was to obtain samples of soil adjacent to and beneath the flattened, buried tanks to assess possible impacts to site soils or groundwater. The project consisted of drilling four inclined borings to approximately 20 feet and the collection of four soil samples from each boring.

There are no surficial signs of the excavation or the buried tanks. The site was previously backfilled and leveled using native materials and native vegetation entirely covers the site. The locations of the tanks were determined using geophysical techniques (see Geophysics Survey, 2,4-D Site, Hanford-North Slope dated April 1994 by Shannon & Wilson, Inc.). Figure 2 shows the boundaries of the tank burial area as determined by geophysical techniques. These boundaries are marked at the site using flagging and were used to determine the drilling points for the current project.

2.0 FIELD INVESTIGATION

On July 19, 1994, an Environmental Technician and a Registered Professional Geologist from Cascade Earth Sciences, Ltd. met with Randy Chong and several representatives of the U.S. Army Corps of Engineers (COE) at the North Slope Job Shack. Two representatives of Environmental West Exploration (the drilling contractor), Driller Bob Sheldon and assistant Wendell Hawley, were also in attendance.

All parties mobilized to the access road to the 2,4-D site where a "tailgate" safety meeting was held from 7:45 am to 8:00 am. Concerns of access to the site from the main road were expressed, especially for the drill rig which was not 4-wheel drive equipped. A discussion of possible health hazards at the site included heat exhaustion, possible chemical exposure, and interaction with area wildlife. After discussions on the level of personal protection equipment (PPE) required by the site, it was determined that a modified Level D (including chemical resistant gloves) would be adequate unless specific site conditions warranted upgrading to respirators and Tyvek.

The driller and a representative of the COE walked the path to the site (approximately one-half mile) to assess the probability of accessing the site. After attempting to access the site, the drill rig became stuck in the loose sand approximately 100 yards from the site. A representative of CES and the COE went to Othello, Washington to purchase plywood to aid in moving the drill rig to the site. From 10:00 a.m. to 10:30 a.m., the drill rig was freed and moved into position at the 2,4-D Site.

After walking the site, it was determined (in conjunction with COE representatives) that all four site borings would have to be performed along the eastern edge of the excavation boundary: access to the opposite side could not be accomplished by the drill rig due to the proximity of the sand dune. The borings were to be started approximately 6 feet from the outer edge of the boundary determined by geophysical methods. Figure 2 shows the locations of the four site borings with the electro-magnetic anomaly outline as a reference. The figure also shows the orientation of the inclined borings and the approximate horizontal extent beneath the anomaly after correction for the inclination. Figure 3 presents a cross-section showing the inclined borings and the approximate dimensions of the excavation based on available site information.

Drilling of the first inclined boring (designated S1) was initiated at 10:30 a.m. The orientation of the boring was approximately 235 degrees azimuth and the drilling stems were inclined 30 degrees from the vertical plane. In conjunction with Richard Fink of the COE, it was determined that split-spoon samples would be collected from the 5 to 7 feet, 10 to 12 feet, 15 to 17 feet, and 20 to 22 feet intervals. The second boring (S2) was initiated at 1:45 p.m. Boring S3 was initiated at 4:00 p.m. and S4 was initiated at 6:30 p.m. There was no evidence that the tanks were struck or penetrated during the drilling process.

Samples were collected into laboratory-prepared 9-ounce jars with Teflon-lined lids. The samples were placed on ice in a cooler for transportation to the laboratory. All sampling equipment and the split-spoons were decontaminated using a three-stage process consisting of a tap water wash, an Alconox wash, and a deionized water rinse. The augers and lead bit were steam cleaned between each boring. All decontamination fluids were placed in lined and sealed 55-gallon drums for disposal after sample results were obtained.

Soils encountered consisted of gray, dry to damp, loose, fine to medium-grained sand. Sand consisted of well-sorted, angular to sub-rounded grains predominantly of quartz and lithic fragments with feldspar and lesser white mica. Some samples showed iron-stained bands. No odors or other discolorations were noted. Refer to Appendix A for copies of the boring logs for the four site borings.

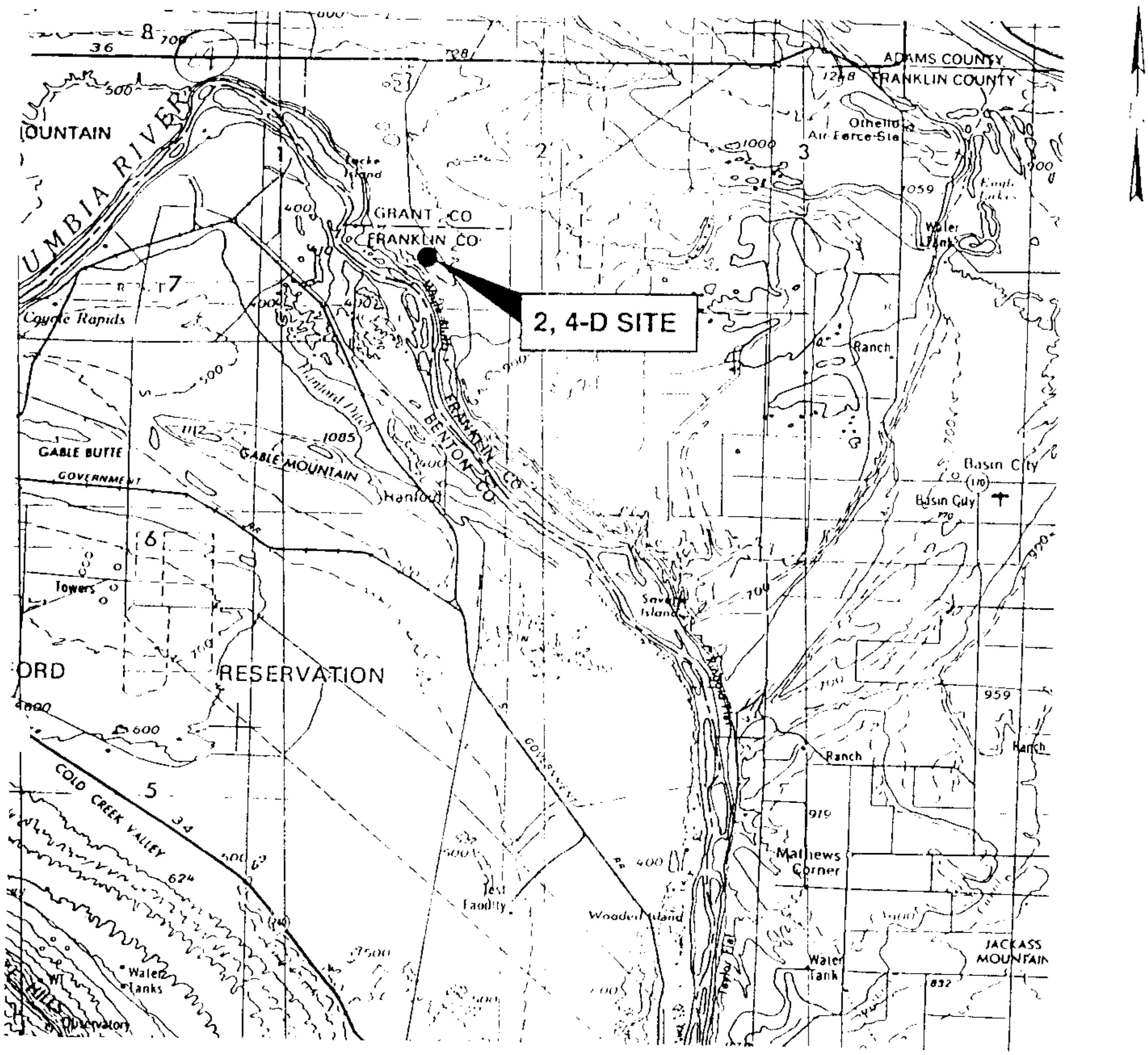
3.0 ANALYTICAL RESULTS/CONCLUSIONS

Eighteen soil samples (the four soil samples from each boring and two duplicate soil samples designated S1-S25 and S3-S25) were submitted to Columbia Analytical Services, Inc. (CAS) in Kelso, Washington. Additionally, a sample split from the first boring was provided to representatives of the Washington Department of Ecology and selected quality assurance samples were provided to the COE for analysis at their Troutdale, Oregon laboratory.

The eighteen soil samples collected from the site borings were analyzed for chlorinated herbicides including 2,4-D using EPA Method 8150A modified. No chlorinated herbicides were detected in these soil samples. The method detection limit for 2,4-D is 0.2 mg/Kg (ppm). Refer to the laboratory reports for the method detection limits for other chlorinated herbicides covered by EPA Method 8150A. The official Laboratory Reports and Chain-of-Custody documentation is presented in Appendix B.

Based on the soil samples collected adjacent to and beneath the 2,4-D Site (and submitted to CAS for analysis), the disposal of the tanks used to store 2,4-D have not significantly impacted the soils beneath the filled excavation. Accordingly, if samples analyzed by the COE Laboratory and the Department of Ecology display similar results, no further actions appear to be required to protect human health and the environment at this time. However, the investigation was not designed to discover all possible contaminants at the site. Future actions or changes in site conditions may warrant additional investigation and/or monitoring to protect the environment and/or limit exposure of site personnel.

B:\352059.RPT\COE24-D.RPT



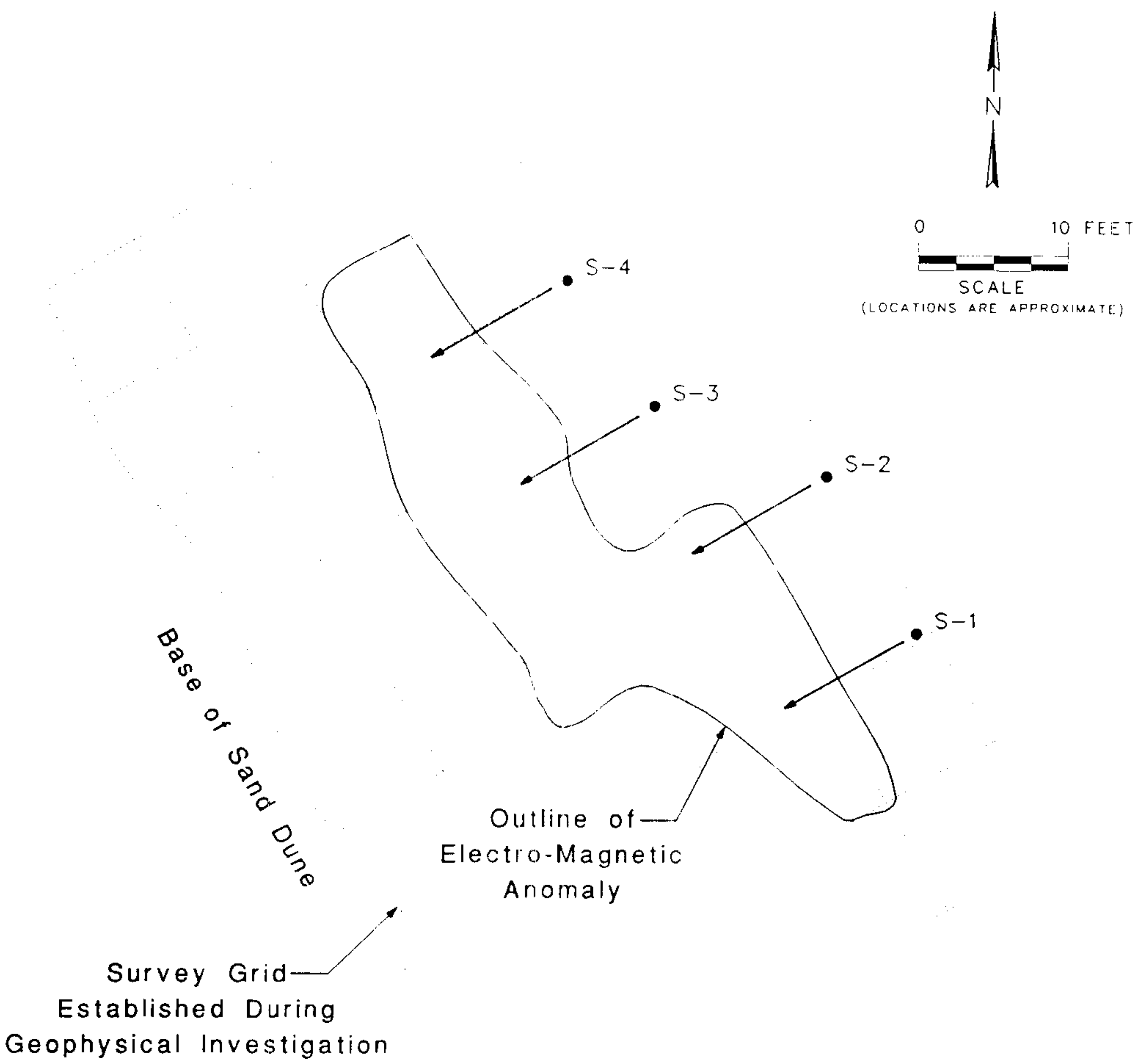
0 5 10

Scale in Miles
1:250,000

FIGURE 1 - Vicinity Map

CORPS OF ENGINEERS
HANFORD 2,4-D SITE

(USGS TOPOGRAPHIC MAP OF
WALLA WALLA, WA 1961)

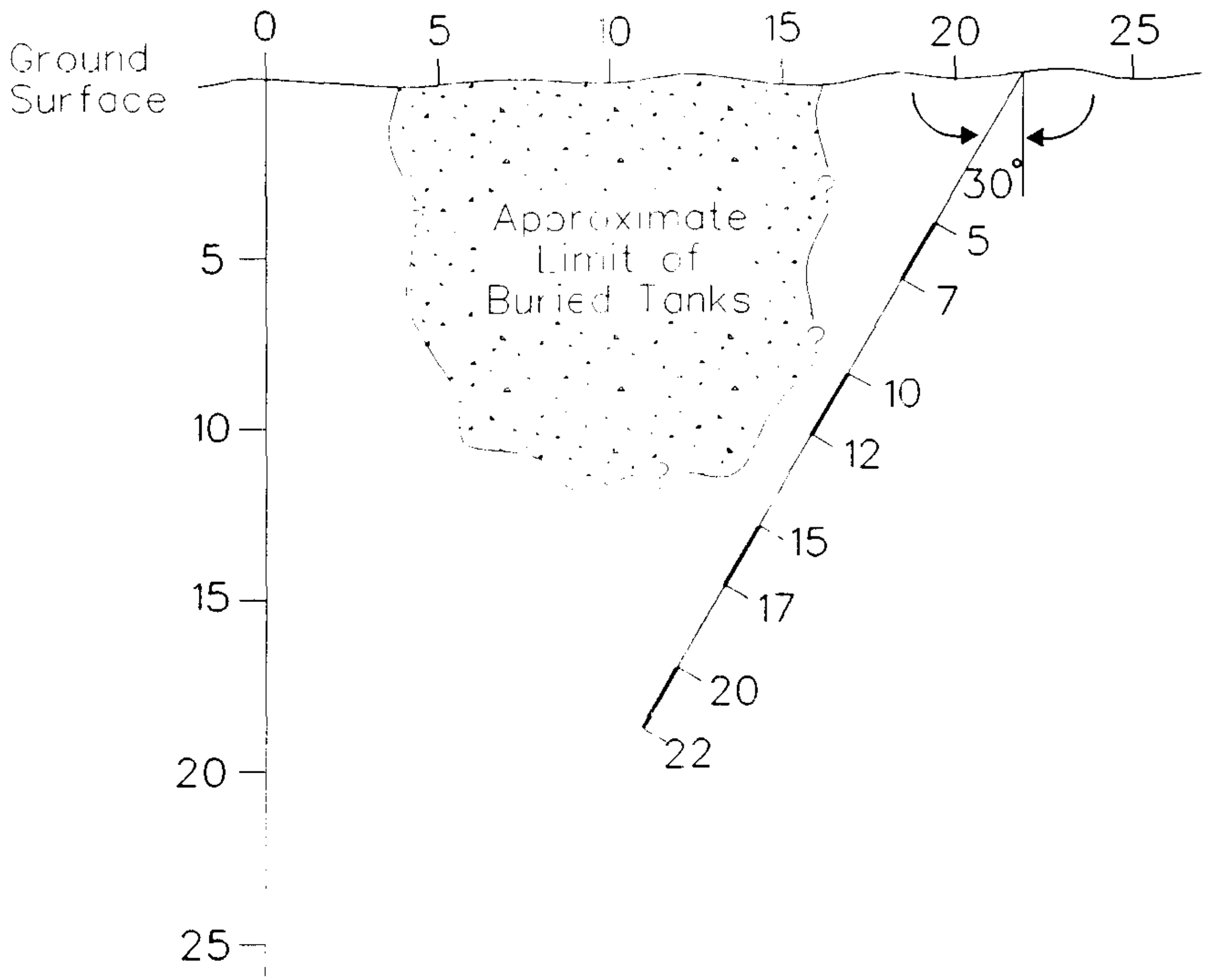


EXPLANATION

S-2 Boring Location with Direction and Horizontal Extent of Inclined Boring

FIGURE 2 - Site Plan

PROJECT NUMBER 352059	CORPS OF ENGINEERS HANFORD 2,4-D SITE
DATE 8/25/94	
DWG. NG / DWG NO. 352059F2	HANFORD, NORTH SLOPE
PROJECT MANAGER SWC	
REVISED	CES CASCADE EARTH SCIENCES, LTD Oregon - Washington - Idaho



EXPLANATION

20
22 Uncorrected sample depth interval

No vertical exaggeration

FIGURE 3 - Cross Section Showing Locations of Soil Sample Collection in Vertical Profile

PROJECT NUMBER 352059	CORPS OF ENGINEERS HANFORD 2,4-D SITE
DATE 8/24/94	
DWG NG / DWG NO 352059F3	HANFORD, NORTH SLOPE
PROJECT MANAGER SWC	
REVISED	CES CASCADE EARTH SCIENCES, LTD Oregon – Washington – Idaho

PROJECT: COE NORTH SLOPE

BORING LOCATION: S1 – SOUTHERN BURN, SOUTH ANOMALY

DRILLED BY: Bob Sheldon Environmental

DRILLING EQUIPMENT: B-80 Air Rotary

CCS

PROJECT NUMBER

COMPLETION DATE: 7/19/94

MONITORING WELL NO. S1

* TOTAL DEPTH	20'
* WELL DEPTH	
FILTER PACK INTERVAL(FT)	
SEAL INTERVAL(FT)	TYPE: Bentonite
GROUND SURFACE ELEV (FT MSL)	TOP OF CASING ELEV (FT MSL)
WELLHEAD	
SIZE (IN)	
TYPE	
STATIC W.L. ELEV (FROM T/C)	

GROUP SYMBOL	INTERVAL (FT)	DESCRIPTION	SAMPLE NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
	SURFACE	Loose fine-grained sand, vegetation skeleton weed		Ground surface
				5.0–7.0 at 11:00 Easy Drilling
	5.0–7.0	SAND: Light gray (10YR ...) fine-grained with minor medium ... fragments, much mica ... most fragments are ... All angular–subrounded		
	10.0–11.5	SAND: light gray (10YR ...) loose, medium grained ... looser at depth. Abundant ... and dark lithic fragments at ... angular–subrounded	S1–S10	10.0–12.0 at 11:10 Easy Drilling
	15.0–17.0	SAND: Gray (10YR 6/1) loose, dense medium coarse grained as above with occasional larger lithic clasts ... angular–subrounded	S1–S15	15.0–17.0 at 11:30 Easy Drilling
	20.0–22.0	SAND: ... medium coarse grained ... no larger ... fragments ... subrounded. Total Depth 20 ft		20.0–22.0 at 11:45 Easy Drilling. Terminate drilling at 20.0'. Set up for decon at 12:00 to 12:15. 12:15 to 12:30 fill hole with bentonite grout. 235 degrees A, 30 degrees off vertical approx. 6 feet from flags at USTs eastern edge

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

* DEPTHS IN FEET BELOW GROUND SURFACE

MONITORING WELL NO. S2

PROJECT: COE NORTH SLOPE

BORING LOCATION: S1 NORTH BORING, SOUTHERN ANOMALY

DRILLED BY: Bob Shepar Environment

DRILLING EQUIPMENT: B-81 Air motors Auger

START DATE

COMPLETION DATE: 7/19/94

SAMPLING EQUIPMENT: Split spoon

*TOTAL DEPTH: 20'

FILTER PACK INTERVAL (FT)

SEAL INTERVAL (FT)

GROUND SURFACE ELEV (FT MSL)

WELLHEAD STICK UP (FT)

STATIC W.L. ELEV (FROM T/C)

GROUP SYMBOL	INTERVAL (FT)	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
	SURFACE	Loose fine-grained ... Dry vegetation			ground surface
					0-1.0 at 14:00
	5.0-7.0	SAND: Light gray ... loose, fine-grained ... subangular-subrounded ... fragments and quartz ...			
	10.0-11.5	SAND: Light gray (10YR ...) loose, medium-coarse grained ... some ... stained bands ... bands: brownish yellow ... grains subangular, subround		S2-S10	10.0-12.0 at 14:10
	15.0-17.0	SAND: Gray (10YR 6/...) ... medium to coarse grained ... lithic fragments and some larger granule-sized lithic clasts ... staining		S2-15	15.0-17.0 at 14:30
	20.0-22.0	SAND: Light gray ... medium-coarse grained. Abundant ... fragments and quartz ... some large ... As above ... fragments approx ... 10% feldspar ... approx 10%		S2-S20	20.0-22.0 at 14:45; Terminate drilling at 20'; 35 degrees A, 30 degrees from vertical approx. ... feet from flagging
		Total Depth = 20 ft			

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

* DEPTHS IN FEET BELOW GROUND SURFACE

PROJECT DOE NORTH SLOPE [illegible]

BORING LOCATION [illegible] SOUTH BORING NORTH ANOMALY

DRILLED BY Bob Sheston [illegible]

DRILLING EQUIPMENT B-80 Air Rotary [illegible]

PROJECT NUMBER [illegible]

LOGGED BY [illegible] CHECKED BY [illegible]

MONITORING WELL

S3

* TOTAL DEPTH	20'
* WELL DEPTH	
FILTER PACK INTERVAL (FT)	
SEAL INTERVAL (FT)	[illegible] - 20
GROUND SURFACE ELEV. (FT MSL)	
WELLHEAD (TOP-UP) (FT)	

GROUP SYMBOL	INTERVAL (FT)	DESCRIPTION	SAMPLE	REMARKS DRILLING CONDITIONS, FIELD READINGS, ETC.
	SURFACE	Loose fine-grained [illegible] Dry vegetation		Ground surface
				[illegible] 0-7.0 at 16:20
	5.0-[illegible]	SAND Light gray [illegible] loose, fine-grained [illegible] Grains are subangular [illegible]		
	10.0-11.5	SAND light gray [illegible] damp, loose, medium grained with occassional larger (pebble [illegible]) fragments of volcanic tuff [illegible] stained band approx. [illegible]		[illegible]0-12.0 at 16:30
	15.0-17.0	SAND gray (10YR [illegible]) loose, [illegible] coarse grained with abundant lithic clasts (dark, 1 mm to 2 mm approx. 40%). Occassional large [illegible] volcanic lithic clasts (white [illegible]) [illegible] smaller silt clasts		[illegible]5.0-17.0 at 16:40
	20.0-22.0	SAND Light gray [illegible] medium-coarse grained with [illegible] coarser sand clasts to [illegible] Quartz approx. 35%, feldspar [illegible] 25%, lithic fragments approx. [illegible] and etc. approx. 10%. All sub[illegible] surrounded		[illegible]0-22.0 at 16:50 Terminate drilling at 20 ft [illegible]35 degrees A, 30 degrees from vertical approx. 6 feet from flagging
		Total Depth= 20 ft		

THIS SUMMARY APPLIES ONLY AT THE [illegible] AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE [illegible] WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS [illegible]

* DEPTHS IN FEET BELOW GROUND SURFACE

PROJECT DOE NORTH SLOPE

BORING LOCATION S4 - NORTH ... NORTH ANDMA

DRILLED BY Bob Sherman, Environmental ...

DRILLING EQUIPMENT ... -80 Air Rotary, Auger

MONITORING WELL ...

S4

COMPLETION DATE ...

*TOTAL DEPTH		*WELL DEPTH		WELLHEAD ...
FILTER PACK INTERVAL (FT)				
SEAL INTERVAL (FT)	20			TYPE
GROUND SURFACE ELEV (FT MSL)		TOP OF ... ELEV (FT MSL)		STATIC WL ELEV (FROM T/C)

GROUP SYMBOL	INTERVAL (FT)	DESCRIPTION	SAMPLE	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
	SURFACE	loose fine grained ... Dry, vegetation		ground surface
				... at 18:45
	5.0-...	SAND light ... loose, fine grained, well ... fines. Mica, quartz, ... feldspar		
	10.0-11.5	SAND light gray (10YR ...) loose, medium grained with ... downward to fine grained ... iron stained zones ... Lithology same as above		...0-12.0 at 19:00
	15.0-17.0	SAND gray (10YR ...) medium grained with ... grained sand clasts ... above. All subangular to ...		15.0-17.0 at 19:15
	20.0-22.0	SAND light ... loose, medium grained ... coarser sand ... above		20.0-22.0 at 19:40
		Total Depth ...		... drilling at ...
				... degrees ... 30 degrees from vertical approx. 6 feet from ...

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

* DEPTHS IN FEET BELOW GROUND SURFACE

Columbia Analytical Services inc.

August 12, 1994

Service Request No.: K944396

Stuart Childs
Cascade Earth Sciences, Ltd.
7515 N.E. Ambassador Place
Portland, OR 97220

Re: **2,4-D Hanford North Slope/Project #94-458**

Dear Stuart:

Enclosed are the results of the sample(s) submitted to our laboratory on July 21, 1994. For your reference, these analyses have been assigned our service request number K944396.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 208.

Respectfully submitted,

Columbia Analytical Services, Inc.

Kevin DeWhitt

Kevin DeWhitt
Quality Assurance Coordinator

KD/td

17 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 206/577-7222 • Fax 206/636-1068

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	U. S. Army Corps of Engineers	**Date Received:**	07/21/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Analyzed:**	07/28/94
Sample Matrix:	Soil	**Work Order No.:**	K944396

Solids, Total
EPA Method Modified 160.3
Percent (%)

Sample Name	Lab Code	Result
94-24D-S3-S5	K944396-001	76.7
94-24D-S3-S10	K944396-002	97.8
94-24D-S3-S15	K944396-003	81.5
94-24D-S3-S20	K944396-004	93.7
94-24D-S3-S25	K944396-005	98.1
94-24D-S4-S5	K944396-006	97.8
94-24D-S4-S10	K944396-007	77.6
94-24D-S4-S15	K944396-008	97.8
94-24D-S4-S20	K944396-009	96.8
94-2,4D,S1-S5	K944396-010	92.6

Approved by Karen L Barrett Date 8-12

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	U. S. Army Corps of Engineers	**Date Received:**	07/21/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Analyzed:**	07/28/94
Sample Matrix:	Soil	**Work Order No.:**	K944396

Solids, Total
EPA Method Modified 160.3
Percent (%)

Sample Name	**Lab Code**	**Result**
94-2,4D,S1-S10	K944396-011	91.1
94-2,4D-S1-S15	K944396-012	79.3
94-24D-S1-S20	K944396-013	96.8
94-24D-S1-S25	K944396-014	92.9
94-24D-S2-S5	K944396-015	92.0
94-24D-S2-S10	K944396-016	97.7
94-24D-S2-S15	K944396-017	91.4
94-24D-S2-S20	K944396-018	97.5

Approved by Karen Bartlett Date 8.12

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: US Army Corps of Engineers
Project: 2,4-D Hanford North Slope/#94-458
Sample Matrix: Soil

Date Collected: 7/19/94
Date Received: 7/21/94
Date Extracted: 7/28/94
Service Request: K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	94-24D-S3-S5	94-24D-S3-S10	94-24D-S3-S15
		Lab Code:	K4396-001	K4396-002	K4396-003
		Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**				
Dalapon	1		ND	ND	ND
MCPP	20		ND	ND	ND
Dicamba	0.1		ND	ND	ND
MCPA	20		ND	ND	ND
Dichloroprop	0.1		ND	ND	ND
2,4-D	0.2		ND	ND	ND
2,4,5-TP (Silvex)	0.05		ND	ND	ND
2,4,5-T	0.05		ND	ND	ND
Dinoseb	0.5		ND	ND	ND
2,4-DB	0.5		ND	ND	ND

Approved By [signature] Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC

Analytical Report

Client:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	94-24D-S3-S20	94-24D-S3-S25	94-24D-S4-S5
		Lab Code:	K4396-004	K4396-005	K4396-006
		Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**				
Dalapon	1		ND	ND	ND
MCPP	20		ND	ND	ND
Dicamba	0.1		ND	ND	ND
MCPA	20		ND	ND	ND
Dichloroprop	0.1		ND	ND	ND
2,4-D	0.2		ND	ND	ND
2,4,5-TP (Silvex)	0.05		ND	ND	ND
2,4,5-T	0.05		ND	ND	ND
Dinoseb	0.5		ND	ND	ND
2,4-DB	0.5		ND	ND	ND

Approved By Karen T Bartlett Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	94-24D-S4-S10	94-24D-S4-S15	94-24D-S4-S20
		Lab Code:	K4396-007	K4396-008	K4396-009
		Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**				
Dalapon	1		ND	ND	ND
MCPP	20		ND	ND	ND
Dicamba	0.1		ND	ND	ND
MCPA	20		ND	ND	ND
Dichloroprop	0.1		ND	ND	ND
2,4-D	0.2		ND	ND	ND
2,4,5-TP (Silvex)	0.05		ND	ND	ND
2,4,5-T	0.05		ND	ND	ND
Dinoseb	0.5		ND	ND	ND
2,4-DB	0.5		ND	ND	ND

Approved By Donna Benneth Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ient:	US Army Corps of Enginee s	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	94-2,4D,S1-S5	94-2,4D,S1-S10	94-2,4D-S1-S15
		Lab Code:	K4396-010	K4396-011	K4396-012
		Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**				
Dalapon	1		ND	ND	ND
MCPP	20		ND	ND	ND
Dicamba	0.1		ND	ND	ND
MCPA	20		ND	ND	ND
Dichloroprop	0.1		ND	ND	ND
-D	0.2		ND	ND	ND
2,4,5-TP (Silvex)	0.05		ND	ND	ND
2,4,5-T	0.05		ND	ND	ND
Dinoseb	0.5		ND	ND	ND
2,4-DB	0.5		ND	ND	ND

Approved By [signature] Date 8-12

S4396HRA.XLS/8/12/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope #94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	94-24D-S1-S20	94-24D-S1-S25	94-24D-S2-S5
		Lab Code:	K4396-013	K4396-014	K4396-015
		Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**				
Dalapon	1		ND	ND	ND
MCPP	20		ND	ND	ND
Dicamba	0.1		ND	ND	ND
MCPA	20		ND	ND	ND
Dichloroprop	0.1		ND	ND	ND
2,4-D	0.2		ND	ND	ND
2,4,5-TP (Silvex)	0.05		ND	ND	ND
2,4,5-T	0.05		ND	ND	ND
Dinoseb	0.5		ND	ND	ND
2,4-DB	0.5		ND	ND	ND

Approved By Tom Bumann Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

lient:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	94-24D-S2-S10	94-24D-S2-S15	94-24D-S2-S20
		Lab Code:	K4396-016	K4396-017	K4396-018
		Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**				
Dalapon	1		ND	ND	ND
MCPP	20		ND	ND	ND
Dicamba	0.1		ND	ND	ND
MCPA	20		ND	ND	ND
Dichloroprop	0.1		ND	ND	ND
4-D	0.2		ND	ND	ND
2,4,5-TP (Silvex)	0.05		ND	ND	ND
2,4,5-T	0.05		ND	ND	ND
Dinoseb	0.5		ND	ND	ND
2,4-DB	0.5		ND	ND	ND

Approved By Karen Bullard Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

lient:	US Army Corps of Engineers	**Date Collected:**	NA
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	NA
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name: Method Blank
Lab Code: K4396-MB
Date Analyzed: 8/3/94

Analyte	**MRL**	
Dalapon	1	ND
MCPP	20	ND
Dicamba	0.1	ND
MCPA	20	ND
Dichloroprop	0.1	ND
ł-D	0.2	ND
2,4,5-TP (Silvex)	0.05	ND
2,4,5-T	0.05	ND
Dinoseb	0.5	ND
2,4-DB	0.5	ND

Approved By Karen Bennett Date 8-12

S4396HRA.XLS/8/9/94

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

.ent:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Date Analyzed:	8/3/94
		Service Request:	K944396

Surrogate Recovery Summary
Chlorinated Herbicides
EPA Method Modified 8150A

Sample Name	**Lab Code**	**Percent Recovery** 2,4-Dichlorophenylacetic Acid
94-24D-S3-S5	K4396-001	61
94-24D-S3-S10	K4396-002	72
94-24D-S3-S15	K4396-003	66
94-24D-S3-S20	K4396-004	75
94-24D-S3-S25	K4396-005	70
24D-S4-S5	K4396-006	76
94-24D-S4-S10	K4396-007	60
94-24D-S4-S15	K4396-008	50
94-24D-S4-S20	K4396-009	64
94-2,4D,S1-S5	K4396-010	70
94-2,4D,S1-S10	K4396-011	73
94-2,4D-S1-S15	K4396-012	75
94-24D-S1-S20	K4396-013	66
94-24D-S1-S25	K4396-014	70
94-24D-S2-S5	K4396-015	69
94-24D-S2-S10	K4396-016	64
94-24D-S2-S15	K4396-017	60
94-24D-S2-S20	K4396-018	71
94-24D-S3-S20	K4396-004MS	69
94-24D-S3-S20	K4396-004DMS	71
Lab Control Sample	K4396-LCS	74
Method Blank	K4396-MB	67

CAS Acceptance Limits: 36-116

Approved By [signature] Date 8-12

S4396HRA.XLS/8/12/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Date Analyzed:	8/3/94
		Service Request:	K944396

Matrix Spike/Duplicate Matrix Spike Summary
Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name 94-24D-S3-S20
Lab Code: K4396-004

	Spike Level		Sample	Spike Result		Percent Recovery			
Analyte	**MS**	**DMS**	**Result**	**MS**	**DMS**	**MS**	**DMS**	**CAS Acceptance Limits**	**Relative Percent Difference**
2,4-D	0.24	0.25	ND	0.23	0.22	96	88	35-125	9
2,4,5-TP (Silvex)	0.08	0.08	ND	0.06	0.06	75	75	33-108	<1
2,4,5-T	0.08	0.08	ND	0.06	0.06	75	75	32-108	<1

Approved By [signature] Date 8-12

S4396HRS.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	US Army Corps of Engineers	**Date Collected:**	NA
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	NA
LCS Matrix:	Soil	**Date Extracted:**	7/28/94
		Date Analyzed:	8/3/94
		Service Request:	K944396

Laboratory Control Sample Summary
Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
2,4-D	0.23	0.21	91	49-115
2,4,5-TP (Silvex)	0.08	0.06	75	40-96
2,4,5-T	0.08	0.06	75	43-105

Approved By Karen Bennett Date 8-12

S4396HRL.XLS/8/9/94

APPENDIX B

CHAIN OF CUSTODY INFORMATION

CHAIN OF CUSTODY RECORD/L...

...UE EARTH SCIENCES, Ltd.

Shipped From:

( ) **Albany** 3425 Spicer Dr., OR 97...	(503) 926-7737	( ) **Medford** 1133 S Riverside #2...			
( ) **Bend** 354 N.E. Greenwood Ave., OR 97701	(503) 385-5068	( ) **Pocatello** PO Box 2379, ID 83206	(208) 237-7041		
( ) **LaGrande** PO Box 2737, OR 97850	(503) 963-7758	(X) **Portland** 7515 N.E. Ambassador Pl., OR 972	(503) 282-7502		
		( ) **Spokane** PO Box 14725, WA 99214	(509) 921-0290		

Hanford North Slope PN: 352059

Normal Sampling Date: 7-19-94

Se... ...port To: Stuart Childs Location: Portland

QA/QC Requirements: YES

Provide Preliminary Results: Verbal / Fax (circle) Fax Number:

Laboratory Name: CAS

Address 1317 S. 13th Ave Kelso WA

Contact Kevin D Phone # 577-7222

SAMPLE I.D.	DATE	TIME	LAB I.D.	PRESERVATIVE	SAMPLE MATRIX	ORGANIC ANALYSIS: Volatile Organic GC/MS 624/8240	Semi-Volatile Organic GC/MS 625/8270	Halogenated Volatiles 601/8010	Aromatic Volatiles 602/8020 BTEX	Total Petroleum Hydrocarbons HCID G D (circle)	Total Petroleum Hydrocarbons EPA 418.1 418.1 MOD (circle)	Total Organic Carbon (TOC) 415/9060	Polyaromatic Hydrocarbons (PAH) 8310 8100 8270 (circle)			INORGANIC ANALYSIS: TCLP Metals As,Ba,Cd,Cr,Pb,Hg,Se,Ag	Metals (total or dissolved) List	Extractable Bases Ca,Na,Mg,K (circle)	Ph,Cond,Cl,SO_4,PO_4,F,Br NO_2,NO_3 (circle)	NH_3N,COD,Total-P,TKN (circle)	OTHER			NUMBER OF CONTAINERS
94-24D-53-S5	7-19	16:20		NONE	Soil					8150 Herbicides														1
94-24D-53-S10		16:30																						1
94-24D-53-S15		16:40																						
94-24D-53-S20		17:10																						
94-24D-53-S25		17:10																						
94-24D-54-S5		18:45																						
94-24D-54-S10		19:00																						
94-24D-54-S15		19:20																						
94-24D-54-S20		19:40																						
~~94~~																								
11																								
12.																								

COMMENTS:

INVOICE INFORMATION

P.O. No.:

Bill To:

SHIPMENT INFORMATION

Shipped via: Sample Receipt:

Seals Intact: Condition:

Temp When Rcd.: °C Seal No.:

Samples Collected By: D. Mascarenas

Relinquished By:	Company:	Date/Time:	Received By:	Company:
[signature]	Cascade Earth Sci	7-21-94 13:00	D Storms	CAS 7/22/94 0...
Relinquished By:	Company:	Date/Time:	Received By:	Company:
Relinquished By:	Company:	Date/Time:	Received By:	Company:

Laboratory:
Please Return Original (White) with Results

White - CES Yellow - Laboratory Pink - Sender

CHAIN OF CUSTODY RECORD/LABORATORY ANALYSIS REQUEST FORM

CASCADE EARTH SCIENCES, Ltd.

Shipped From:

( ) **Albany**	3425 Spicer Dr., OR 97321	(503) 926-7737	( ) **Medford**	1133 S Riverside #22, OR 97501	(503) 779-2280
( ) **Bend**	354 N.E. Greenwood Ave., OR 97701	(503) 385-5068	( ) **Pocatello**	PO Box 2379, ID 83206	(208) 237-7041
( ) **LaGrande**	PO Box 2737, OR 97850	(503) 963-7758	(X) **Portland**	7515 N.E. Ambassador Pl., OR 97220	(503) 282-7502
			( ) **Spokane**	PO Box 14725, WA 99214	(509) 921-0290

Project: 24-D Hanford North Slope PN: 352059
Turn Around: normal Sampling Date: 7-19-94
Send Report To: stuart childs Location: PORTLAND
QA/QC Requirements: YES
Provide Preliminary Results: Verbal / Fax (circle) Fax Number:
Laboratory Name: CAS
Address 1317 S. 13th AVE Kelso, WA 98626
Contact KEVIN D Phone # 206 577-7222

	SAMPLE I.D.	DATE	TIME	LAB I.D.	PRESERV-ATIVE	SAMPLE MATRIX	ORGANIC ANALYSIS: Volatile Organic GC/MS 624/8240	Semi-Volatile Organic GC/MS 625/8270	Halogenated Volatiles 601/8010	Aromatic Volatiles 602/8020 BTEX	Total Petroleum Hydrocarbons (circle) HCID G D	Total Petroleum Hydrocarbons EPA 418.1 418.1 MOD (circle)	Total Organic Carbon (TOC) 415/9060	Polyaromatic Hydrocarbons (PAH) 8310 8100 8270 (circle)			INORGANIC ANALYSIS: TCLP Metals As,Ba,Cd,Cr,Pb,Hg,Se,Ag	Metals (total or dissolved) List	Extractable Bases (circle) Ca,Na,Mg,K	Ph,Cond,Cl,SO_4,PO_4,F,Br NO_2,NO_3 (circle)	NH_3N,COD,Total-P,TKN (circle)	OTHER			NUMBER OF CONTAINERS
1	94-24D, S1-S5	7-19	11:00		NONE	SOIL				EPA 8150 Herbicides															
2	94-2,4D,-S1-S10	7-19	11:50		NONE	SOIL																			
3	94-2,4D-S1-S15	7-19	12:40		NONE	SOIL																			
4	94-24D-S1-S20	7-19	13:10		NONE	SOIL																			
5	94-24D S1-S25	7-19	13:10		NONE	SOIL																			
6	94 24D S2 S5	7-19	14:00																						
7	94 24D S2 S10	7-19	14:20																						
8	94 24D S2 S15	7-19	14:30																						
9	94 24D S2 S20	7-19	14:45																						
10																									
11																									
12																									

COMMENTS

INVOICE INFORMATION
P.O. No.:
Bill To:

SHIPMENT INFORMATION
Shipped via: Sample Receipt:
Seals Intact: Condition:
Temp When Rcd.: Seal No.:
Samples Collected By: D Mascarinas

Relinquished By: [signature]	Company: Cascade Earth Sc	Date/Time: 7-21/94 1800	Received By: D Storms	Company: CAS 7/22/94 0800
Relinquished By:	Company:	Date/Time:	Received By:	Company:
Relinquished By:	Company:	Date/Time:	Received By:	Company:

Laboratory: White - CES Yellow - Laboratory Pink - Sender
Please Return Original (White) with Results

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client CES Work Order K94 4396.

Cooler received on 7/22 and opened on 7/22 by RH

1. Were custody seals on outside of cooler? YES NO
   If yes, how many and where? 2-front
   Were signature and date correct? YES NO
2. Were custody papers properly filled out (ink, signed, etc)? YES NO
3. Did all bottles arrive in good condition (unbroken)? YES NO
4. Were all bottle labels complete (i.e. analysis, preservation, etc)? YES NO
5. Did all bottle labels and tags agree with custody papers? YES NO
6. Were correct bottles used for the tests indicated? YES NO
7. Were VOA vials checked for absence of air bubbles, and noted if so? ~~YES NO~~ NA
8. Temperature of cooler upon receipt 6.1

Explain any discrepancies

		YES	NO
pH	Reagent		
12	NaOH		
2	HNO_3		
2	H_2SO_4		

YES = All samples OK
NO = Samples were preserved at lab as listed

VOC Vial pH Verification (Tested after Analysis) ☐ All Samples pH ≤ 2 ☐ Following Samples Exhibited pH > 2		

Comments:

Sample I.D.	Reagent	Vol. Added

APPENDIX C

RAW DATA

SAMPLE DESCRIPTION

SERVICE REQUEST #: K944396

ANALYST: Kristine Craven

DATE: 7/28/94

LAB ID	SAMPLE ID	DESCRIPTION
K4396-001	94-240-53-S5	sand with water on top
-002	94-240-53-S10	dry sand
-003	94-240-53-S15	sand, rocks, water
-004	94-240-53-S20	sand
-005	94-240-53-S25	dry sand
-006	94-240-54-S5	dry, sand & soil
-007	94-240-54-S10	sand, water, rocks
-008	94-240-54-S15	Sand
-009	94-240-54-S20	sand
-~~06~~ 010 KC 7/28/94	94-2,40,51-S5	wet sand
-011	94-2,40,51-S10	wet sand
-012	94-2,40-51-S15	water, rocks, sand
-013	94-240-51-S20	dry sand
-014	94-240-51-S25	wet sand
-015	94-240-52-S5	wet sand
-016	94-240-52-S10	dry ~~wet~~ KC 7/28/94 sand
-017	94-240-52-S15	wet sand
-018	94-240-52-S20	Sand

REVIEWED BY: Karen [illegible]

DATE: 07/29/94